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Popular Woodworking

July 1998 #103

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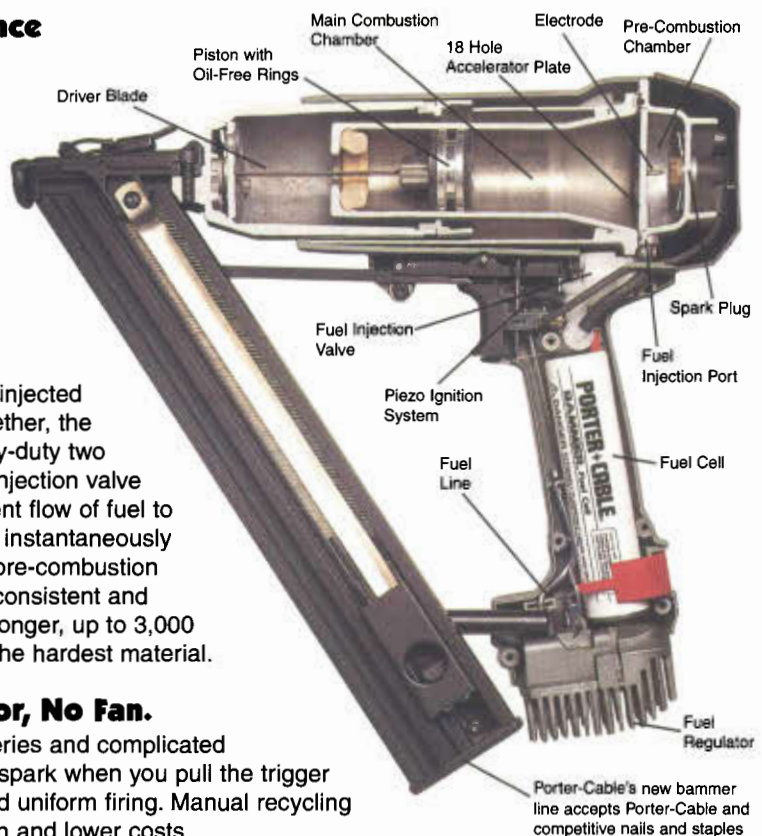
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Features

Garden Arbor Bench

30

This is one of those projects that is so simple and gets so many compliments. Danny Proulx shows you the easy way to build this impressive and comfortable nook for your garden.

Bungalow Mailbox

48

Don't spend \$300 to \$500 on a fashionable Arts & Crafts letterbox for your home. Make ours for just \$30 and a weekend.

Grill Cart

50

This project will quickly become your barbecue buddy. It's got everything you need for the perfect cookout and will stand up to the worst weather.

The Truth About Polyurethane Glue

54

After using polyurethane glue in our shop for 18 months we talked to the glue experts to find out if the polyurethane adhesives are living up to their initial promise.

How to Choose the Best Finish For You

58

Before you reach for that can of polyurethane again, read this article. The latest installment in our "Ten Commandments of Finishing" series might make you convert to shellac.

Game Bench

64

With \$20 and almost no tools you can build the bench that sits in front of country stores everywhere. It's perfect for lollygagging or for an important game of checkers.

Planter Box

66

Our planter box looks great on your front porch in warm weather and moves right into your living room during the

winter. And because it's a "Little Shop That Could" project, you know it's going to be a snap to build.



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Project File

This special section, exclusive to Popular Woodworking, features building basics for seven projects.

Blanket Chest

It's a traditional blanket chest that looks impressive at the foot of a bed and holds enough blankets for an Alaskan winter.

Noah's Ark

Even if you don't have children, you'll want to build this decorative ark as a centerpiece for your dining room table.

Bud Vases

Beginning turners and experts will love these vases, which use glass cigar tubes to hold the flowers.

Dancin' Man

Your grandfather might have had one of these toe-tapping toys. We show you how to build it and the secret to making it dance.

Casserole Carrier

You'll be the talk of the town when you waltz into your next potluck dinner carrying this swanky caddy for your casserole.



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PullOut Plans

PullOut Plans



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Beach Table

Our lightweight portable table is perfect for keeping sand out of your sandwich — and it folds up for easy transport.

Collectibles Shelf

Michel Theriault shows you how to build this simple pine shelf that's perfect for your collection of figurines, dolls or tools.

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See PullOut Plans



Are we on target?

We want to know what type of projects you want to see in future issues. So throughout this issue, you'll see this symbol next to every project. If you like that project, simply circle that project's identification number on the postage-paid card located at the back of this magazine. We'll use this information to help plan future issues.



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SAFETY NOTE

Safety is your responsibility. Manufacturers place safety devices on their equipment for a reason. In many photos you see in *Popular Woodworking*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Don't copy us. Think about each procedure you're going to perform beforehand. Think ahead. **Safety First!**

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OUT ON A LIMB

When is a "hair" too much?



AS A WOODWORKER, where do you weigh in on the accuracy scale? Is $\frac{1}{32}$ " good enough? What about $\frac{1}{64}$ "? Are you losing any sleep over .005", or even .002"? Just what is .002" anyway? Does anyone care?

We can see $\frac{1}{32}$ " on our tape measures, and you can make a real good guess about $\frac{1}{64}$ " by hitting the middle between those two fine hash marks. But you'll need dial calipers to see what these single-digit measurements in thousandths (that's thousandths of an inch) really are.

Because you might not have a dial caliper, here are some everyday objects that I measured. Human hair: .002"-.003", or two to three thousandths. The thickness of a page of this magazine: .002". Kleenex tissue: .005". Most business cards: .011"-.012". Just what is $\frac{1}{64}$ " in thousandths? .0156".

So now that we're thinking real small, just how accurate do you need to be to work wood and build projects with a reasonable amount of success? If you are a commercial cabinetmaker, the standard of accuracy is $\frac{1}{16}$ " over 8'. That's a tight standard that only the best shops work to with any regularity.

But what about *your* shop? Of course, it depends on what you are building. A cutting board is different from an end table, which is different from a free-standing cabinet, which is different yet from a built-in bookshelf.

Here are some guidelines I usually follow for my shop work. These evolved during my nearly 20 years of commercial experience and from working with woodworkers who consistently produced quality work remarkably fast with few mistakes. Let me add that some were fanatical about accuracy, while others had a relaxed attitude.

When preparing material that will be cut into parts, first make the mater-

ial as dimensionally accurate as you can, say to within .01". That's to say $\frac{3}{4}$ " material should be within .01" of that thickness. Do this because as you build, adding pieces to pieces, the finished size of the project can grow or shrink considerably. By the same token, make sure edges are square — not almost, not sort of, but square. This should also apply to any kind of miter cut — 45 degrees is just that, not almost.

When cutting parts to final size, use two standards. First, the parts should be within $\frac{1}{64}$ " of the intended width or length. Second, follow the concept of sameness. That is, the sides of a box can be off by $\frac{1}{64}$ ", but they should be off the same. That's why cutting parts on the same machine set-up is important.

When you are cutting joints, whether they are dados, rabbets, mortises, tenons, etc., cut or machine them to within .01". This is especially the case with housed joints like the mortise and tenon. It's only when these joints fit properly that they perform properly. And I can tell you from experience that it's more time efficient to set up the machine accurately than it is to later fit each joint by hand.

Every woodworker will develop his or her own standards or tolerances. I've tried to outline what are to me, at least, reasonable standards that reliably lead to an easy time when that inevitable moment of truth arrives: assembly.

If you'd like to read more on this subject, I've developed a booklet that I'd be happy to send you at no charge. Just drop me a note with a self-addressed envelope that has at least 55 cents postage attached to: Steve Shanesy, Accuracy Booklet, 1507 Dana Ave., Cincinnati, OH 45207. **PW**

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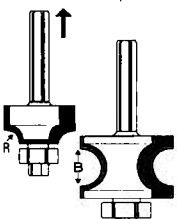
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WL-1040	1/16"	*9.
WL-1041	1/8"	*9.
WL-1042	3/16"	*9.
WL-1043	1/4"	*9.
WL-1044	5/16"	*10.
WL-1045	3/8"	*11.
WL-1046	1/2"	*13.

1/2" Shank

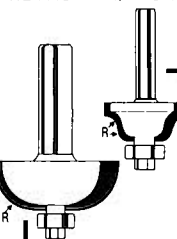
WL-1049	1/8"	*9.
WL-1042-5	3/16"	*9.
WL-1050	1/4"	*9.
WL-1044-5	5/16"	*10.
WL-1051	3/8"	*12.
WL-1052	1/2"	*13.
WL-1053	5/8"	*16.
WL-1054	3/4"	*18.
WL-1055	7/8"	*25.
WL-1056	1"	*27.
WL-1057	1-1/8"	*30.
WL-1058	1-1/4"	*30.



Bullnose Bits with Bearing

1/4" Shank • Bead

Opening	
WL-1100	1/4" *12.
WL-1101	3/8" *14.
WL-1102	1/2" *16.
WL-1103	5/8" *18.
WL-1104	3/4" *19.
1/2" Shank	
WL-1110	1/4" *12.
WL-1111	3/8" *14.
WL-1112	1/2" *16.
WL-1113	5/8" *18.
WL-1114	3/4" *19.
WL-1115	1" *22.
WL-1116	1-1/8" *25.
WL-1117	1-1/4" *28.
WL-1118	1-1/2" *32.



Cove Bits

1/4" Shank • Radius	
WL-1159	1/8" *10.
WL-1160	3/16" *10.
WL-1161	1/4" *11.
WL-1162	3/8" *13.
WL-1163	1/2" *14.

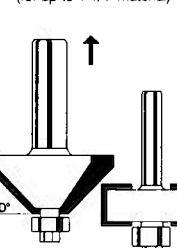
Cove Bits (continued)

1/2" Shank	
WL-1169	1/8" *10.
WL-1170	1/4" *11.
WL-1171	3/8" *13.
WL-1172	1/2" *14.
WL-1173	5/8" *18.
WL-1174	3/4" *20.

Chamfer Bits

1/4" Shank • Degree	
WL-1180	15° *10.
WL-1181	25° *10.
WL-1182	45° *12.
WL-1183	45° *14.
(for up to 3/4" material)	
WL-1184	45° *10.
WL-1185	11-1/2° *12.
WL-1186	15° *12.
WL-1187	22-1/2° *12.
WL-1188	30° *14.
WL-1189	45° *15.
WL-1190	45° *22.

(for up to 1-1/4" material)



Rabbeting Bits

1/4" Shank • Kerf	
WL-1220	1/2" *11.
WL-1220-2	1/16" *10.
WL-1220-3	1/8" *10.
WL-1220-4	1/4" *10.
WL-1220-5	3/8" *10.
1/2" Shank	
WL-1225	1/2" *11.
WL-1225-2	1/16" *10.
WL-1225-3	1/8" *10.
WL-1225-4	1/4" *10.
WL-1225-5	3/8" *10.
WL-1225-6	3/4" *12.

Roman Ogee Bits

1/4" Shank • Radius	
WL-1230	5/32" *13.
WL-1231	1/4" *15.
1/2" Shank	
WL-1235	5/32" *13.
WL-1236	1/4" *15.

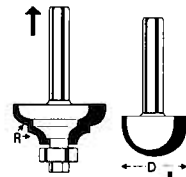
Double Roman Ogee

1/4" Shank • Radius	
WL-1240	5/32" *18.
WL-1241	1/4" *20.
1/2" Shank	
WL-1245	5/32" *18.
WL-1246	1/4" *20.

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1/4" Shank • Radius	
WL-1250	5/32" *18.
WL-1251	1/4" *20.
1/2" Shank	
WL-1252	5/32" *18.
WL-1253	1/4" *20.

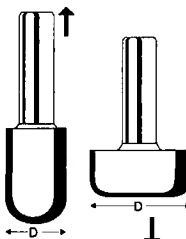


Core Box Bits

1/4" Shank • Diameter	
WL-1370	1/8" *10.
WL-1371	1/4" *8.
WL-1371-1	3/8" *9.
WL-1372	1/2" *10.
WL-1373	3/4" *12.

Roundnose/Core Box

1/2" Shank • Diameter	
WL-1375	1/4" *8.
WL-1375-1	3/8" *11.
WL-1376	1/2" *12.
WL-1377	3/4" *14.
WL-1378	1" *16.

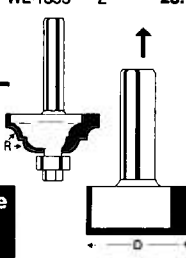


Bowl & Tray Cutter

1/4" Shank • Diameter	
WL-1380	7/16" *13.
WL-1381	3/4" *15.
1/2" Shank	
WL-1385	3/4" *15.
WL-1386	1-1/4" *18.

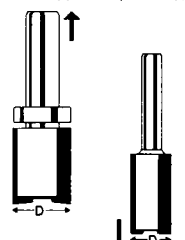
Dado & Planer Bit

1/4" Shank • Diameter	
WL-1390	3/4" *12.
1/2" Shank	
WL-1391	3/4" *12.
WL-1392	1" *14.
WL-1393	1-1/4" *15.
WL-1394	1-1/2" *16.
WL-1395	2" *28.



Pattern Cutting Bit

1/4" Shank • Diameter	
WL-1400	1/2" *12.
WL-1401	5/8" *12.
WL-1402	3/4" *12.
1/2" Shank	
WL-1405	3/4" *15.
WL-1406	1-1/8" *16.



Straight Bits

1/4" Shank • Diameter	
WL-1001	1/8" *10.
WL-1002	3/16" *5.
WL-1002-5.5	5.5mm *5.

(for undersized 1/4" plywood)

WL-1003	1/4" *5.
WL-1004	5/16" *5.
WL-1005	3/8" *5.
WL-1006	15/32" *5.

(for undersized 1/2" plywood)

WL-1007	1/2" *6.
WL-1008	9/16" *6.
WL-1009	5/8" *7.
WL-1010	23/32" *8.

(for undersized 3/4" plywood)

WL-1011	3/4" *9.
WL-1012	1" *10.
1/2" Shank	
WL-1020	15/64" *5.
WL-1021	1/4" *5.
WL-1019	5/16" *5.
WL-1022	3/8" *5.
WL-1023	7/16" *5.
WL-1024	15/32" *5.

(for undersized 1/2" plywood)

WL-1025	1/2" *6.
WL-1027	5/8" *8.
WL-1028	23/32" *8.

(for undersized 3/4" plywood)

WL-1029	3/4" *9.
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Corner Lock Mitres

For up to 5/8" material

WL-1420-2 1/4" shank *25.

For 1/2" to 3/4" material

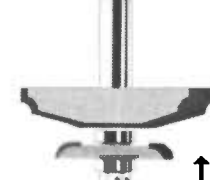
WL-1420-1 1/2" shank *30.

For material 3/4" to 1-1/4"

WL-1420 1/2" shank *38.

For the Shaper

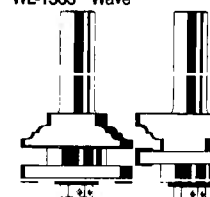
Lock Mitre WL-1581 *40.



Horizontal Panel Raiser

with Undercutter • 1/2" Shank

WL-1346	Ogee	*49.
WL-1347	Traditional	*49.
WL-1348	Convex (Cove)	*49.
WL-1359	12° Facecut	*49.
with Quarter Round		
WL-1363	Wave	*49.



2-piece Rail & Stile Cutter Sets

1/2" Shank Set

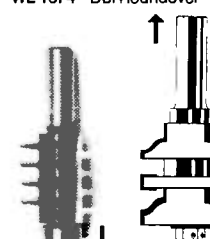
WL-1360	Ogee Profile	*59.
WL-1361	Roundover	*59.
WL-1362	Cove & Bead	*59.

1-piece Rail & Stile Cutter Sets

Just raise the cutter to make the matching cut. No changing or reversing.

1/2" Shank

WL-1365	Ogee Profile	*49.
WL-1366	Roundover	*49.
WL-1367	Cove & Bead	*49.
WL-1368	Wedge	*49.
WL-1374	Dbl Roundover	*49.



Finger Joiner

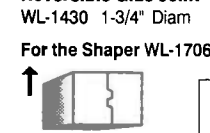
Router Bit WL-1429 *39.

For the Shaper WL-1580 *89.

Reversible Glue Joint

WL-1430 1-3/4" Diam *35.

For the Shaper WL-1706 *35.



Drawer Corner Lock

Makes drawer side separation virtually impossible

1/2" Shank

WL-1435 For 1/2" material *30.

WL-1435 For 1/2" material *30.

WL-1435 For 1/2" material *30.

WL-1435 For 1/2" material *30.

WL-1435 For 1/2" material *30.

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WL-1435 For 1/2" material *30.

WL-1435 For 1/2" material *30.

WL-1435 For 1/2" material *30.

SHAPER CUTTERS

3/4" BORE

Corner Round

WL-1509	1/8"	*22.
WL-1510	1/4"	*24.
WL-1511	3/8"	*26.
WL-1512	1/2"	*26.
WL-1513	3/4"	*30.
WL-1514	1"	*32.
WL-1515	1-1/4"	*38.

Bead

WL-1520	1/4"	*24.
WL-1521	3/8"	*26.
WL-1522	1/2"	*26.
WL-1523	3/4"	*28.
WL-1524	1"	*30.

Flute

WL-1530	1/4"	*24.
WL-1531	3/8"	*26.
WL-1532	1/2"	*26.
WL-1533	3/4"	*28.
WL-1534	1"	*30.

Rabbeting/Straight

WL-1540	1/4"	*24.
WL-1541	3/8"	*26.
WL-1542	1/2"	*26.
WL-1543	3/4"	*28.
WL-1544	1"	*30.
WL-1545	1-1/2"	*32.
WL-1546	2"	*48.

SHAPER CUTTERS 3/4" BORE

1-piece Rail & Stile

Just raise the cutter to make the matching cut. No changing or reversing.

WL-1500	Roman Ogee	*89.
WL-1501	Roundover	*89.
WL-1502	Cove & Bead	*89.
WL-1503	Dbl Roundover	*89.

WL-1600

WL-1601

WL-1602

WL-1603

WL-1604

WL-1605

WL-1606

WL-1607

WL-1608

WL-1609

WL-1610

WL-1611

WL-1612

WL-1613

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WL-1617

WL-1618

WL-1619

WL-1620

WL-1621

WL-1622

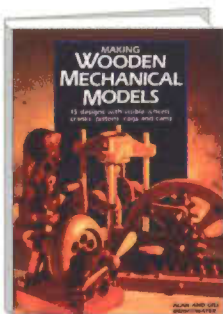
WL-1623

WL-1624

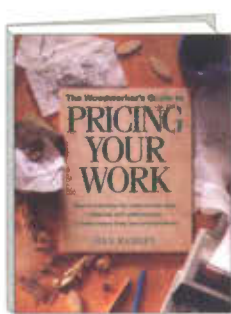
WL-1625

WL-1626

WL-1627



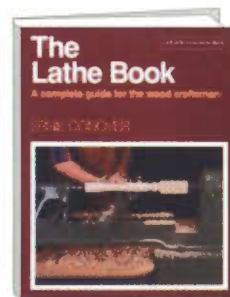
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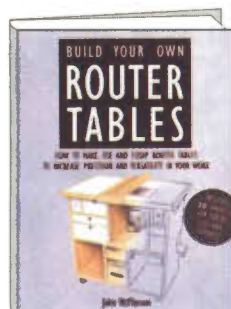
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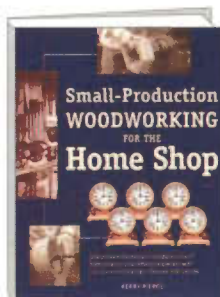
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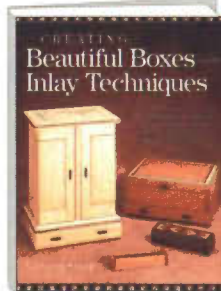
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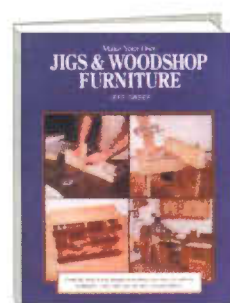
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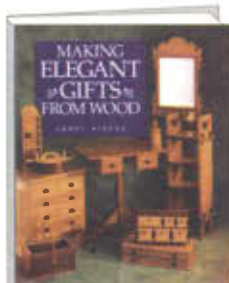
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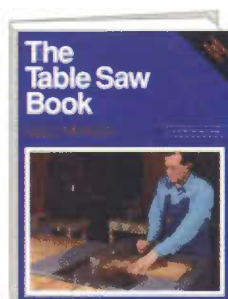
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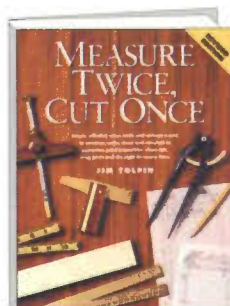


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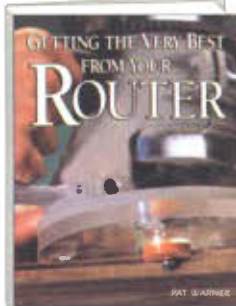
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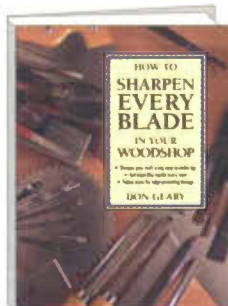
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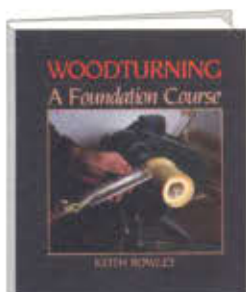
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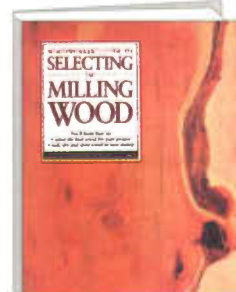
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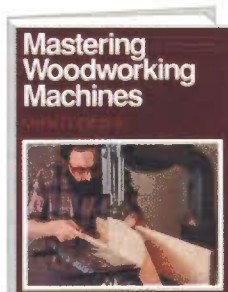
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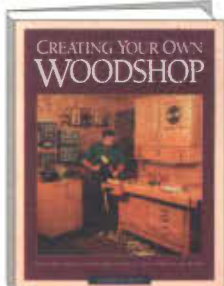
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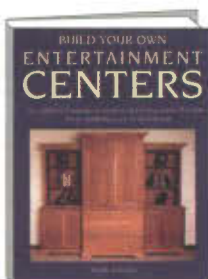
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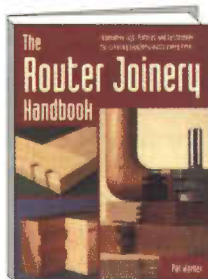
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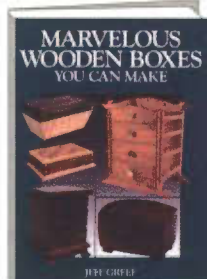
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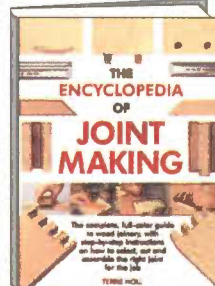
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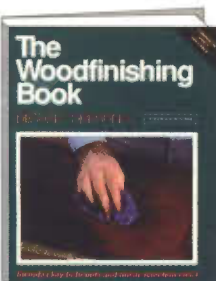
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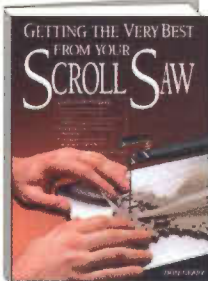
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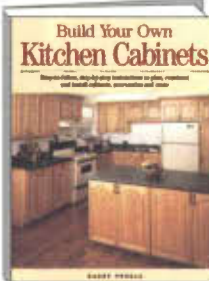
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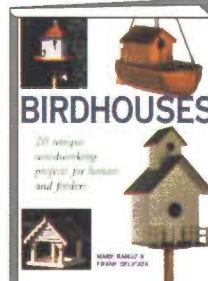
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From the PW Mailbag . . .

We welcome your comments about *PW* or anything related to woodworking. We'd also like to see color pictures of what you're building. Send your input to: Infeed/Outfeed, *Popular Woodworking*, 1507 Dana Ave., Cincinnati, OH 45207. Our e-mail address is: popwood@earthlink.net. Letters may be edited for publication.

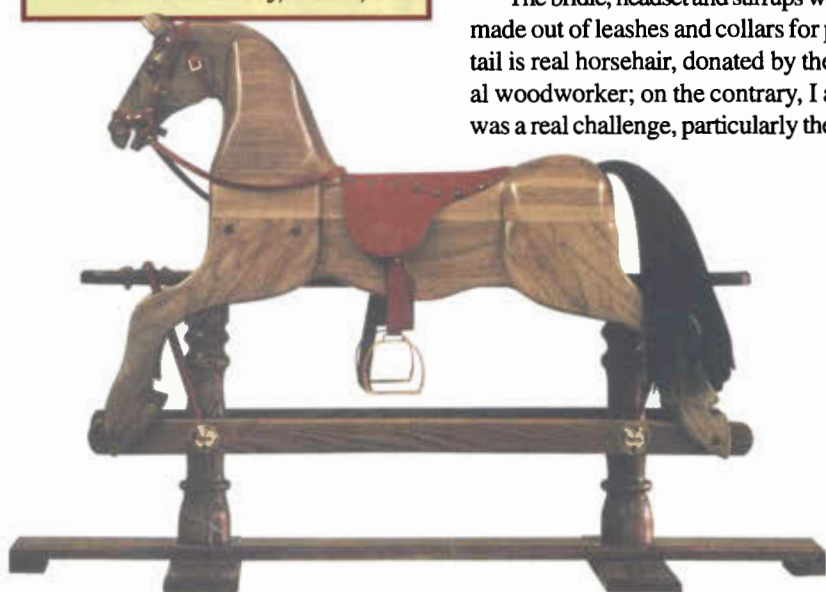
—Steve Shanesy, editor, *PW*

A horse fit for a granddaughter

I thought you might just be interested to see how your magazine motivated this longtime subscriber to spring into action. Here's a photo of my interpretation of the rocking horse you featured in the July 1996 issue. At the time I wanted to make something special for my 1-year-old granddaughter, and you came to the rescue! The minute I saw that rocking horse, I knew that was the one.

The bridle, headset and stirrups were made out of leashes and collars for pets. The eyes are a pair of matching marbles. The tail is real horsehair, donated by the horse of a friend of mine. I am not a professional woodworker; on the contrary, I am a well and irrigation contractor. All in all this was a real challenge, particularly the carving. Thanks a lot and keep up the good work.

Nicholas Lindemulder
Wayne, New Jersey



Same project, different interpretation

I have always wanted to carve a rocking horse because my wife is a collector of them. In your July 1996 issue I saw the article "Making the Little Red Rocker." I read the article three times and said, "That's the one." I have never done any carving before, and I also had to learn to use a lathe. What a challenge.

Bruce Brown
Wayland, New York



A practical stereo cabinet

After reading about all the discussion about "master craftsmanship" in this magazine, I decided to add my two cents. I make many mistakes when I build a project, but each project gets a little better and I make it a little more difficult.

As you can see in the photo of my entertainment center (please disregard the clutter and dust on the project so my wife won't be upset) no one can tell what kind of joint I used to attach the oak stiles. My daughters couldn't care less about how the projects are made, and I don't think I could build something they wouldn't like. That is one of the things I enjoy about woodworking. I can build something for my wife or daughters and it's like giving them an expensive Christmas present that didn't cost me much.

Kenneth D. Grady
Poplar Bluff, Missouri
Continued on page 12

Help! I need Shopsmith parts

I have an old Shopsmith model #10-E made by Magna that needs a few parts, but I'm having trouble finding a source for the parts. Any suggestions?

Warren H. Hauge
Missoula, Montana

Warren, you're not alone. First, we'd recommend visiting Shopsmith's home page on the internet (www.shopsmith.com) or call 937-898-6070. Or try Battles Hardware in California (562-698-3714). They stock many hard-to-find Shopsmith parts.

—David Thiel, senior editor

MITER STOPS THAT MAKE FINISH WORK AS EASY AS PAINT BY NUMBERS.

As anybody knows, getting the right measurement is key to making a precise cut. That's why the stops on the Craftsman Compound Miter Saw are color-coded for crown molding, rafter and miter cuts. If you want to know more, like the fact it packs a 12" carbide-tipped blade and powers up to 3.5 HP, go to our Web site at www.sears.com/craftsman. You'll find everything you need to finish any job with unflinching exactness.

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INFEEED/OUTFEED

Continued from page 10

Projects from Doug Green

Thanks for publishing most of my letter from July, even though you edited out one of my two main points: It's not how you make the joint, it's which joint you make, that ultimately yields quality. Fussiness isn't the issue; all competent woodworkers are "fussy." Fussy is just another word for "accurate" or "skilled," and it applies to and is just as critical to rabbets and dados as well as finger joints and dovetails.

Whatever technique is used, we all want to do a good job; sloppy execution of any joint is just, well, sloppy.

Doug Green
Boulder, Colorado



Butterfly Butsudan, a Buddhist prayer altar, built by Doug Green.

Foreign tools hurt Americans

Your editorials always provide me with some "food for thought." The editorial in the March 1998 issue ("Not Made in the USA," issue #101) was no exception. Whereas you wrote on the premise that buying tools should deal only with the quality of those tools, I view the topic as much broader. It deals with a serious concern to all of this nation's citizens.

With the narrow path of consideration that you chose, your conclusion was that we should be grateful to those who bring us products produced in foreign lands. To this conclusion I say "Nuts!" because I see it provoking the ultimate conclusion that we should cease all production in America and rely on foreign-made products.

Please! Things are bad enough. Since World War II, American manufacturing has disappeared. We now have several generations of amateur woodworkers who have never seen quality. Some foreign-made machines are less sophisticated and of lesser quality than American-made machines of the 1920s.

With each closing or relocation of an American production facility, Americans lose so that a few may gain. A \$300 foreign-made drill press is of no use to the guy who has lost his job. I believe that it's reasonable and wise to be informed about the source of a product when contemplating a purchase. Believing thus, I am at a loss as to why you wrote your editorial.

John Gascoyne
Appomattox, Virginia

Use caution when buying imported tools

About 20 years ago I got into woodworking when my wife wanted a curio cabinet and couldn't find one she liked in any store. I bought a Taiwanese table saw, a router and some sandpaper.

I bought the table saw because it was \$90. The motor quickly burned out. A motor repair shop said it would cost more to fix the motor than to buy a new saw. I went through three saws to finish the project.

I am now a wiser buyer and have quite a few Taiwan-made tools in my shop that are of excellent quality. However, I will buy nothing that is made in Red China! The Chinese government does not honor its contracts and underpays its workers. I even send a letter explaining my position to any mail order house that I place an order with. **PW**

Ira Falk
Las Vegas, Nevada

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with your 1/4" or 1/2" Router, or your 1/2" or 3/4" Shaper.

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SET #	BIT STYLE	LRG. DIA.	SET PRICE
#1301	1/4" Shank Router	* 2"	\$69.95
#1302	1/2" Shank Router	* 3-1/2"	\$79.95
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*Ball bearing included

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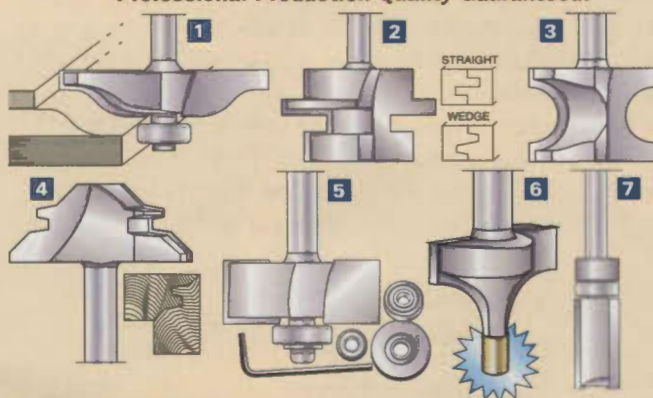
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#1423 2" Large Diameter\$29.95

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#1333 Straight\$29.00

#1335 Wedge\$29.00

3 BULL NOSE

#1330 1/2" Dia. of Circle\$16.00

#1331 3/4" Dia. of Circle\$21.00

4 LOCK MITRE BIT

#1433

2" Dia., Stock thickness: 1/2"-3/4" ..\$37.50

5 RABBETING KIT

Ball bearing guides allow 4 depth of cuts: 3/8", 7/16", 5/16", 1/4". Set: 1/4" shank rabbeting bit, 4 bearings (3/8", 1/2", 5/8", 3/4") & hex key.

#1425 1-1/4" Large Diameter....\$25.00

6 BRASS PILOTE

Rout into tight spaces and sharp corners. These bits have Brass Pilots, measuring only 5/32" in dia., instead of the usual 1/2" ball bearing.

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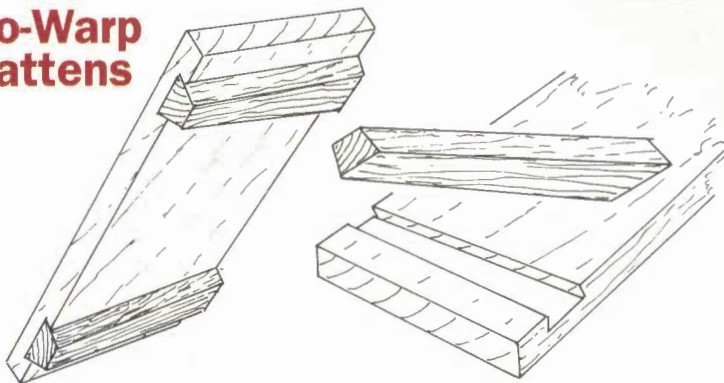
TRICKS OF THE TRADE



Each issue of *Popular Woodworking* offers tips and tricks for the woodworker that we've accumulated from readers, contributors and from our own workshop and woodworking experiences.

We want to encourage the free exchange of these time-saving and safety ideas for all woodworkers. If you have a good trick, we'd love to hear about it. Send your trick, whether it's one your father taught you or one you came up with on your own, to *Popular Woodworking*, Tricks of the Trade, 1507 Dana Ave., Cincinnati, OH 45207.

No-Warp Battens



You can prevent a wide board such as a door or outdoor table top from warping by screwing or nailing strips across it. But a better way is to attach tapered dovetail-section battens using a router. The battens can be driven in tight, without glue, and will lock in place without preventing the boards from expanding and contracting due to climate changes.

The dovetail slot across the board need not be much: $\frac{1}{2}$ " width in a 12" board should be enough. The depth of the slots should be about one-third the thickness of the wood. Battens should be thick enough for stiffness — a little more than the thickness of the board.

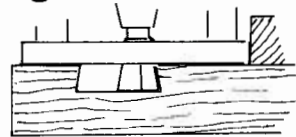
Remove most of the waste with a straight cutter (**figure 1**), then use a dovetail cutter with the router against a guide strip (**figure 2**). Make the batten too long at first. Taper it and plane it to the dovetail angle, then drive it in and cut off the surplus ends.

*Percy W. Blandford
Warwickshire, England*

Figure 1



Figure 2



Convertible Roller Stand



Some projects require cutting both sheet goods and solid lumber on the table saw. A "transfer ball" support stand works best for sheet materials such as plywood, whereas a "roller stand" is best suited for solid wood. To reduce the time required to change the stands, I made a combined ball transfer/roller stand. Converting from the roller to the transfer ball support is easy. Just open the two trunk latches and swing the roller down so that the sheet stock rests on the transfer balls.

*T.R. Bristol
Grants Pass, Oregon*

Editor's Note: We took T.R.'s good idea a step further and thought of mounting transfer balls on one side of a strip and the roller stand to the other. With this strip mounted on a pivot with a pin release, the stand could be converted without having to adjust the height of the stand each time.

An 'Udderly' Simple Suggestion

I recently realized that not everybody knows the simplest way to turn a rubber glove used for finishing completely right-side out. I read one tip that used compressed air blown in to the glove to do the job — it'll work, but you need an air compressor. My wife told me she just blew into the open end two or three times to get them fully open. I showed her the trick I learned as an army medic in World War II and have used for 50 years.

With the glove inside-out, fold the wrist opening so it is right-side out for a few inches. Hold opposite sides of the wrist opening between the thumbs and index fingers of each hand. Rapidly fold the opening of the glove over itself to trap air inside the glove. Then, holding the fold shut, squeeze the ballooned-out body of the glove with the other hand. The glove unfolds right-side out, including the fingers. **PW**

*Barnett C. Howard
Sisters, Oregon*



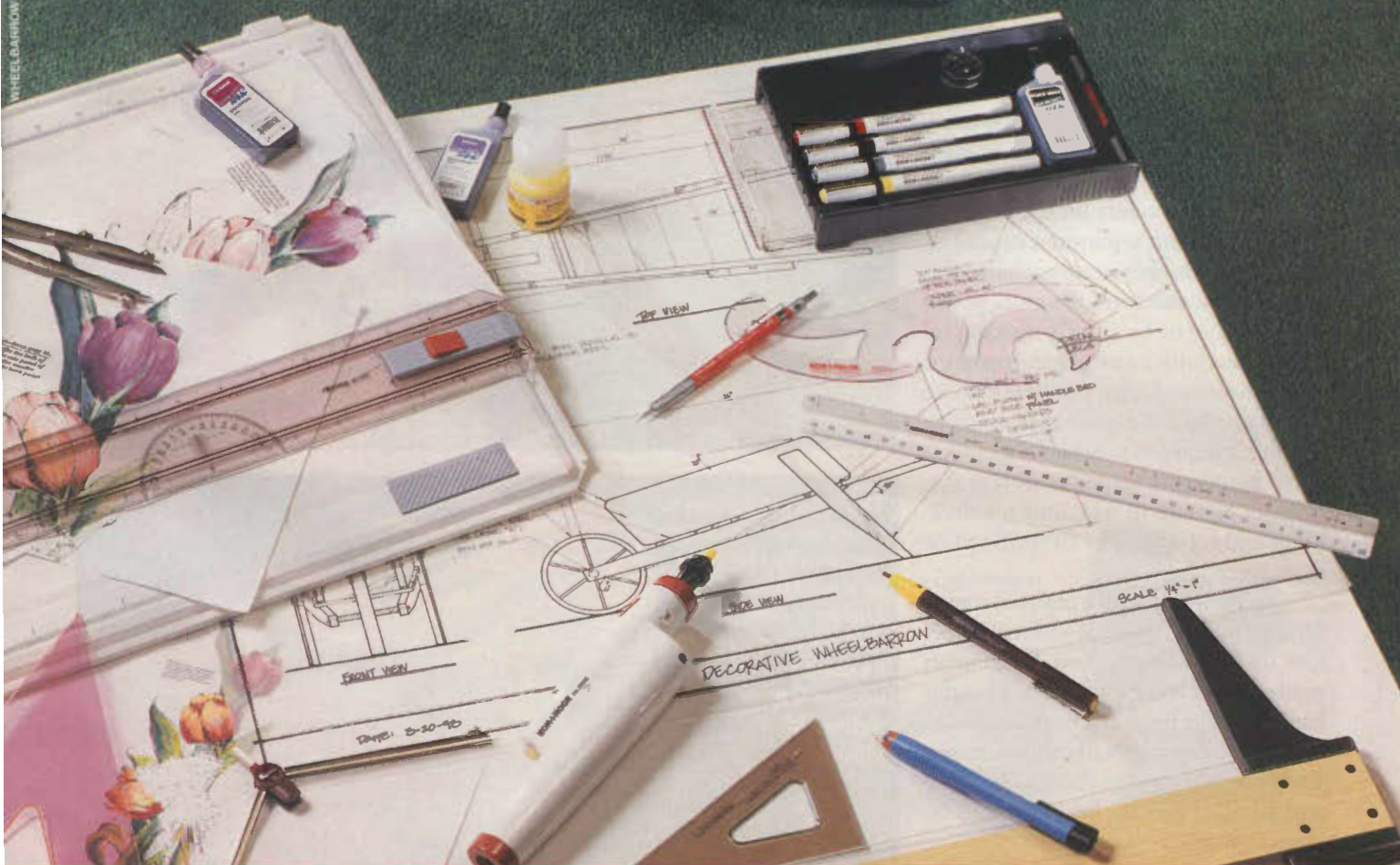
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The most practical solution is to cut matching slots into the two mating edges and glue a spline in the slots. Splines keep the components locked together and help prevent separation caused by stresses and changes in atmospheric conditions. You can form the slots with a dadoing tool or by simply making repeat passes with a saw blade. But in the case of a picture frame, you have to make identical cuts into eight edges, so some fussing is required to achieve accuracy. Most woodworkers make miters frequently enough to welcome a convenient and reliable way to form spline slots precisely.

Our jig works with a portable router. Straight bits, available in various diameters, do the cutting. A two-edged miter guide allows working on left- or right-hand cuts. The fence can be positioned to accommodate various stock thicknesses. The outboard support (table extension) will maintain even the heaviest router on "firm footing."

Continued on page 18



The outboard support (table extension) allows the use of even heavy-duty routers. An access slot in the jig's braces accepts a C-clamp when one is needed for additional work security.



The slotting jig can be clamped in a vise or secured to the edge of a workbench. The jig's clamp swivels so it can be used to secure left- or right-hand miters

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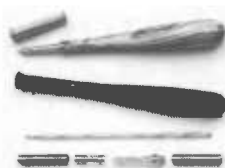
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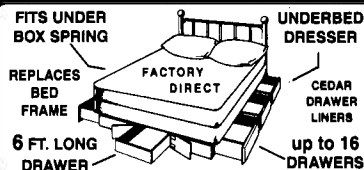
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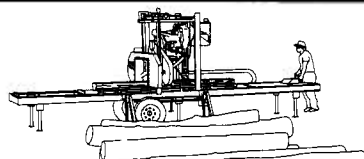
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18 Popular Woodworking

CRIS CUTS

Continued from page 16

Figure 1

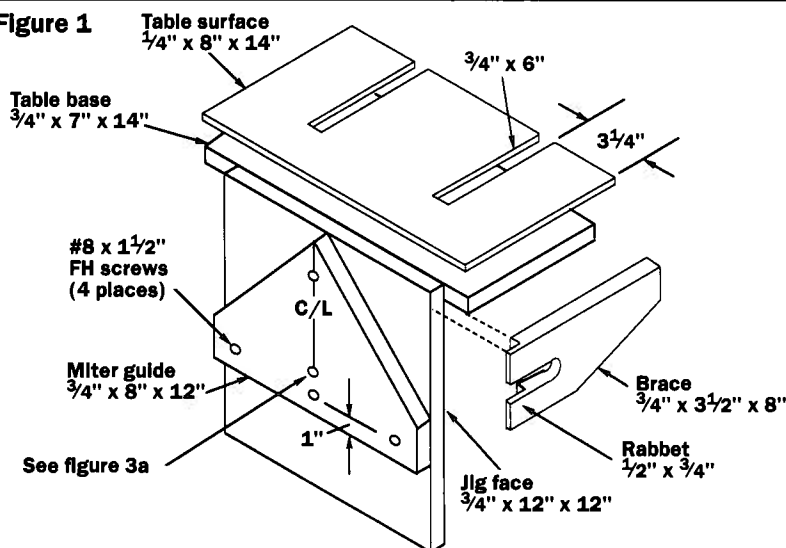
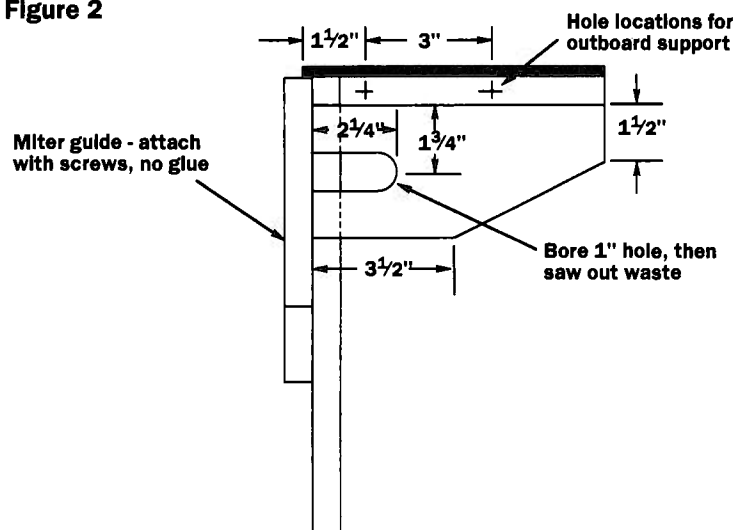


Figure 2



Constructing the Jig

Construction details for the jig's body are shown in Figs 1 and 2. Start by using 3/4" plywood for the jig's face and the table base. Join these parts with glue and 6d finishing nails. The hardwood braces are next. Your best bet is to cut a piece of stock twice as long as you need and to form the rabbet at each end; then shape the round-end slot that provides access for a C-clamp when one is needed. First bore a 3/4" hole and then saw out the waste. Now you can halve the part and form the tapers so you end up with two braces. Remember that these are left- and right-hand components.

To add the braces, first coat contact areas with glue, then use finishing nails

in the jig's face and two or three #8 x 1 1/2" flathead screws down through the table base. Be sure that the angle between the face of the jig and the table base is 90 degrees.

Cut a piece of tempered hardboard to the size of the table surface, then form the slots needed for the fence guides. You can form these slots as you did those in the braces. You can attach the table surface by using glue or contact cement. If you use contact cement, don't coat the areas where the slots will be. In either case, be sure the front edge of the table surface projects 1/4" beyond the jig's face.

Cut the piece required for the miter guide, draw an accurate centerline across

Continued on page 20

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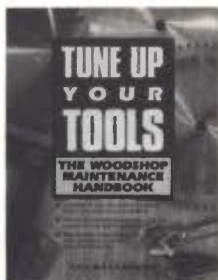
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30T	\$125	\$99	\$89	\$79
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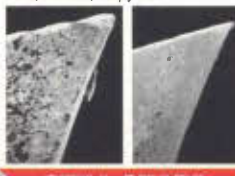
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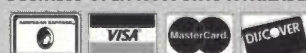
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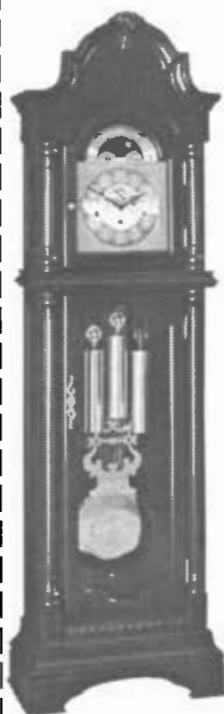
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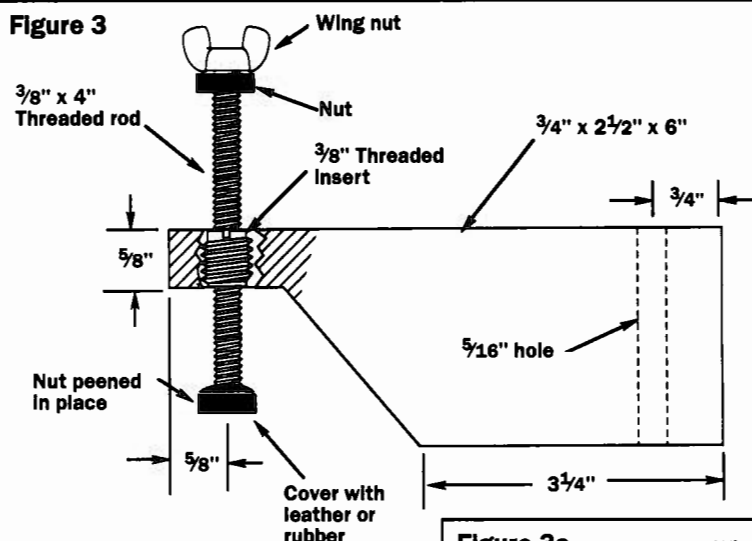
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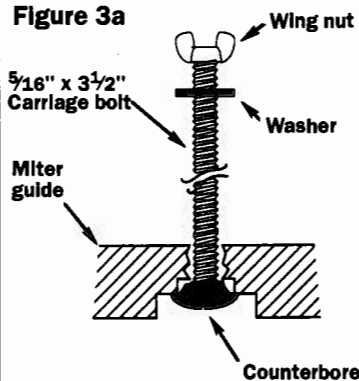
Figure 3



its width and then use a right-angle template to mark the 45-degree lines. Saw outside the lines and finish to the lines by sanding. Drill and counterbore for the carriage bolt that is needed for the clamp before installing the miter guide (see figure 3a). The miter guide is held with screws — no glue. This is so it can be replaced or adjusted if necessary. Be sure the angle between the bearing edges of the guide and the projection of the table surface is 45 degrees.

Figure 3 details how the clamp is made. Don't cut the piece to shape until

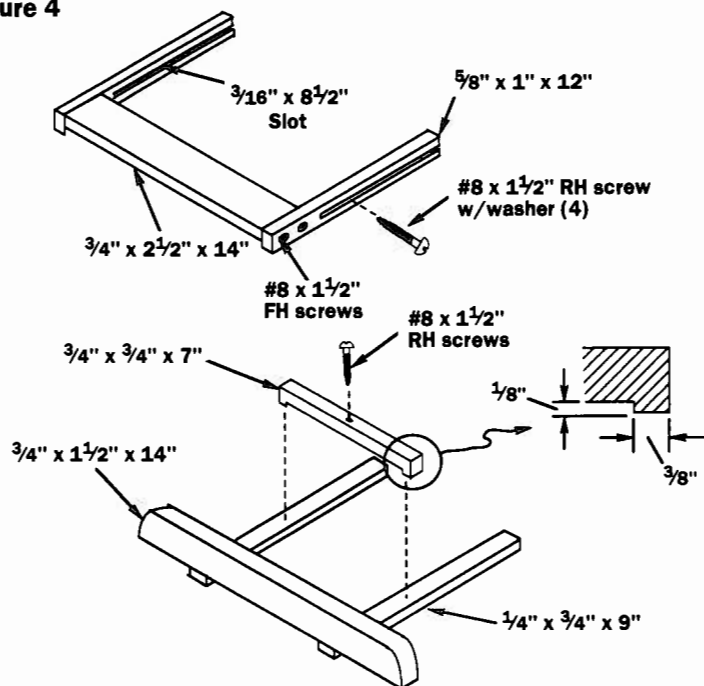
Figure 3a



after you have installed the threaded insert and drilled the $\frac{5}{16}$ " hole.

Continued on page 22

Figure 4



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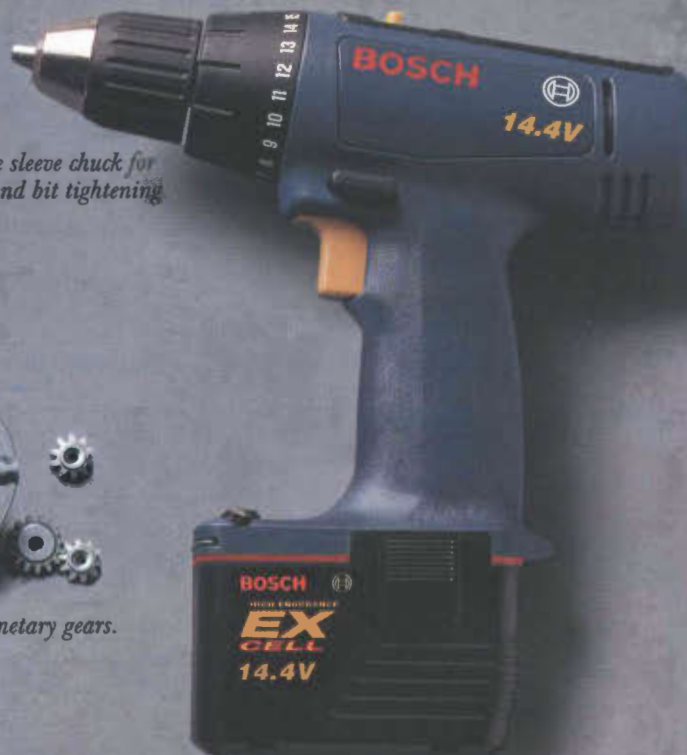


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BOSCH



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CRIS CUTS

Continued from page 20

Figure 5

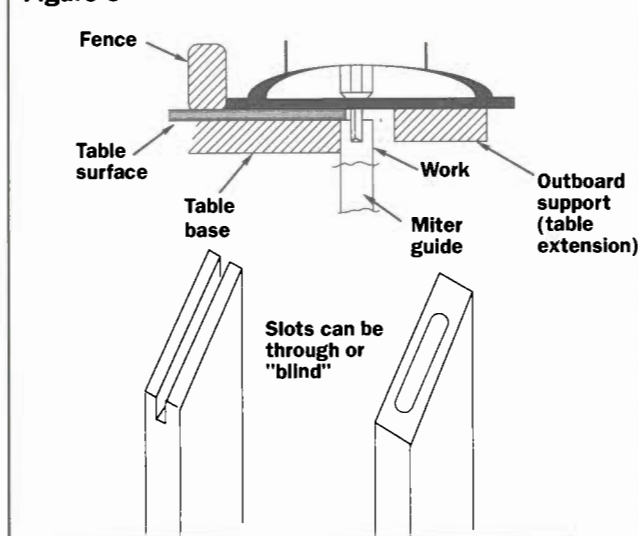
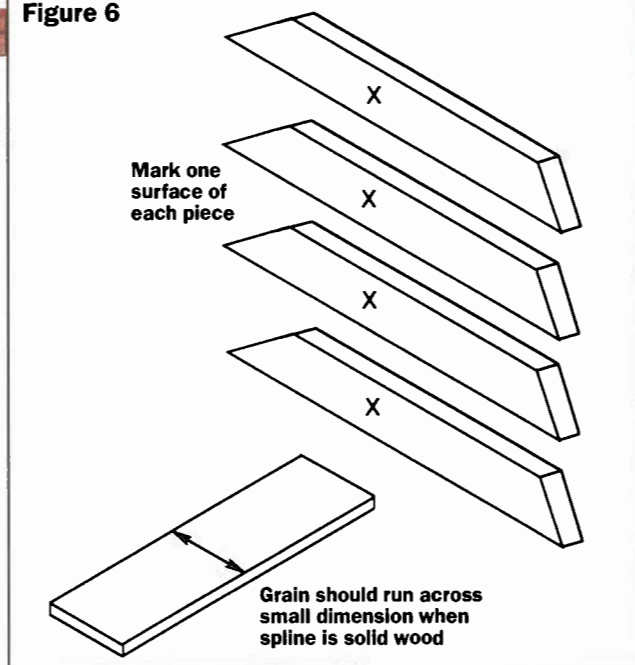


Figure 4 supplies construction information for the outboard support and the fence. When you install the screws that secure the support, have the assembly in place so its top edges are flush with the table surface.

Using the jig

Place your workpiece against the miter guide and push it up

Figure 6

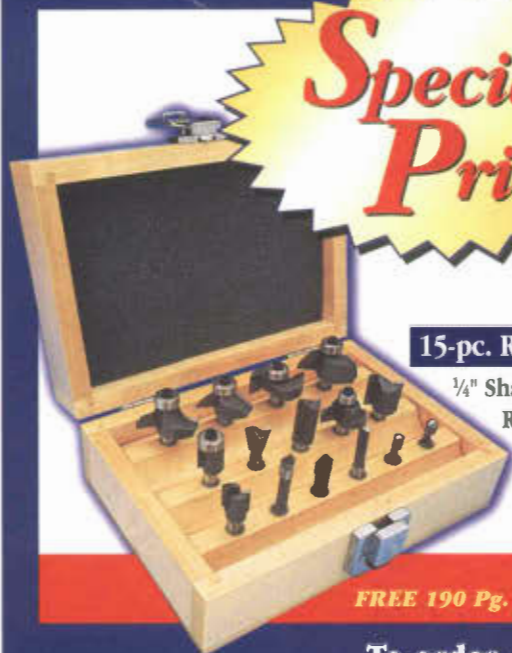


so the miter cut butts against the projection of the table surface. Secure it with the jig's clamp or, whenever necessary, an extra clamp. Adjust the fence so the router bit will be on the centerline of the miter cut and move the router left to right (Fig. 5). As always, when a deep cut is needed, results are better when the chore is accomplished by making repeat passes. When this is necessary, make the initial cut on all parts before



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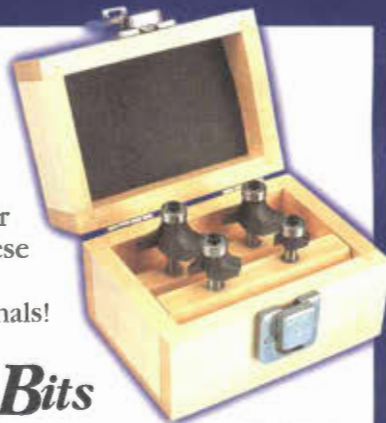
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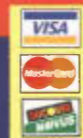
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Figure 7



A rotary cutter like the "SpirAcut" can be used for light-duty work but it must be fitted with a conventional router bit.

changing the projection of the router bit.

Mark the same surface on each of the components (Fig. 6) and place this surface against the face of the jig. This way the slots will be aligned even if they are not exactly centered.

For light duty work, the jig can be used with a rotary cutter like the Bosch "SpirAcut" or Ryobi's Multi-Tool (see our "New Products" section in this issue) being used in Figure 7. Be aware though that the penetrating bits normally used with such a tool won't work for this application. You must still work with a regular router bit.

Caution

The jig is a most useful accessory but it will not guarantee results if you are careless when sawing the miters. The cuts must be 45 degrees for results to be perfect. **PW**

R.J. DeCristoforo is the author of more than 30 woodworking books and a member of Popular Woodworking's advisory board. His latest book, "The Master Jig Book," will be published in spring 1999 by Popular Woodworking Books.

CAPTION the CARTOON

RYOBI



#31

ADAM A. RUM
from Huntington,
New York, is the
winner of our
"Caption the Cartoon
Contest #29"
from the March issue
and recipient of the
Ryobi sanding set.

Congratulations Adam!

**The runners-up receive
a one-year subscription
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*"There's nothing
like working with
wood to help you
unwind."*

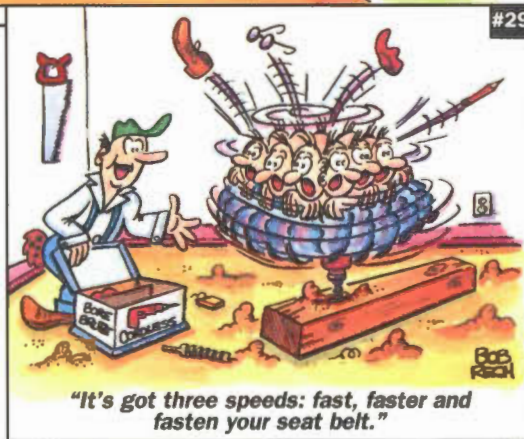
Dave Thissell,
from Yorba Linda,
California

*"So... What do you
think of the new
variable speed
range: zero to
spin dry?"*

Jeff Early,
from Ft. Huachuca,
Arizona

*"Did I mention
the lifetime
warranty and the
optional term
life policy?"*

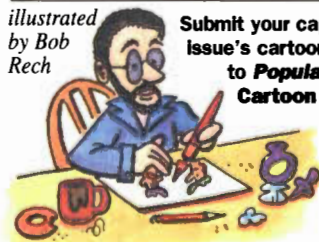
Jim Dudley,
from Savannah,
Georgia



#29

*"It's got three speeds: fast, faster and
fasten your seat belt."*

*illustrated
by Bob
Rech*



Submit your caption(s) for this
issue's cartoon on a postcard
to **Popular Woodworking**,
Cartoon Caption #31, 1507
Dana Ave.,
Cincinnati, OH
45207 by June
22, 1998. Winning
entries will be cho-
sen by the maga-
zine's editorial staff.

**The winner will receive Ryobi's Detail Biscuit
Joiner. This compact machine, with its die-cast
base and see-through fence, cuts slots for "Accu-
biscuits," which join stock that would be too
small for standard biscuit joiners.**

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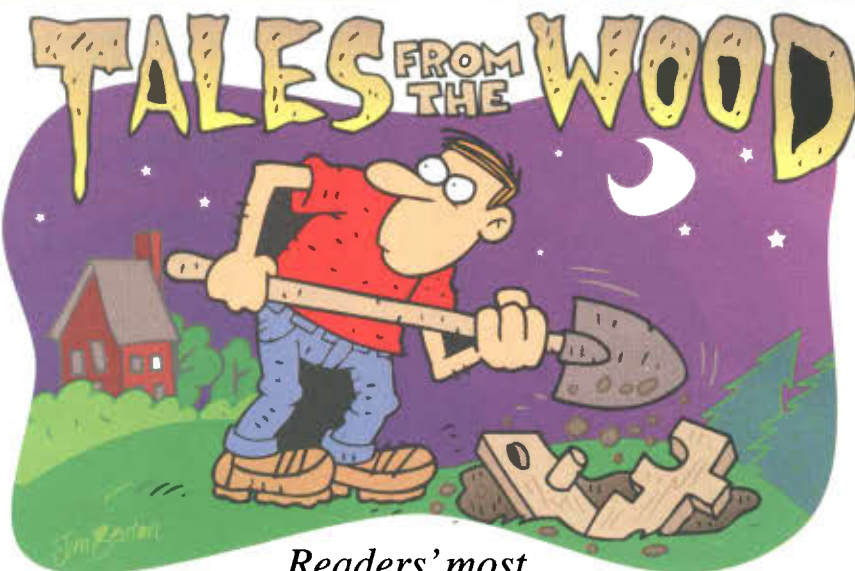


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WOOD TALES



*Readers' most
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WINNER! If Only I Wore Bow-Ties...

While remodeling our house we had a hot water heating system put in. The only problem with the new system was that the copper lines upstairs ran through our bedroom closet, which overheated the closet in the winter. My wife asked me to install a metal vent on the door to help ventilate the closet. I assured her it was no problem and could be done with the right tool. I'd only need to buy a sabre saw. (I try to get at least one tool for each job she asks me to do.)

I marked the opening for the vent and began the cut with my brand-new sabre saw. It cut like a hot knife through butter, and I was proud of the nice hole in the door. Now I merely had to screw in the metal vent. When I opened the closet door, I found that all my ties had been cut in half. I had forgotten to take my tie rack off the back of the door. Needless to say my wife was hysterical with laughter. But I got the last laugh. I got a new sabre saw and a whole bunch of new ties.

Walter Brath
LaPorte, Indiana

Share Your Story & Win!

Turn your favorite tale from the woodshop into a \$150 gift certificate from Lee Valley Tools in *Popular Woodworking's* "Tales from the Wood" contest. We're looking for your funniest, most embarrassing or incredible story. And if we can learn something from your yarn—even better.

Each issue, our editors choose the best tale and print it here. Runners-up receive a Veritas Sliding Square (shown at right) from Lee Valley Tools, the catalog company that features an impressive array of quality woodworking tools, supplies and accessories. One final rule: Please, no stories about people getting hurt. That's not funny.

To make things easier, you don't even have to write your story down. Just call our hotline anytime at (513) 531-2690 ext. 587 and leave your tale and daytime phone number. Or you can e-mail your story to us at popwood@earthlink.net or mail it to: Tales from the Wood • *Popular Woodworking* • 1507 Dana Ave. • Cincinnati, Ohio 45207



Grandfather Sure Had His Priorities Straight

One hot sticky August afternoon I was sitting in the shade of a Eucalyptus tree watching my grandfather doing some carving on a lectern for a local church when a neighbor stopped by. After sharing some talk on the current weather and the likelihood of rain, he asked my grandfather if he could borrow his compass plane. At the time I had no idea what a compass plane was. I had never seen one.

After a short pause, my grandfather repositioned the tobacco in his mouth and replied, "Charlie... (again, a pause with a spit of tobacco) There are three things I don't lend out: (another pause and another spit of tobacco) my tools... my car... and my wife (another pause) ... In that order."

Many years later I inherited my grandfather's tools, and in his huge tool box I found the compass plane. Whenever I use it I think back to that hot August day when farmer Charlie stopped by. I have actually used that little ditty myself when certain neighbors ask to borrow whatever.

*Gene Weinberger
Lindenhurst, New York*

Teaching Your Kids About Tools Can Be Really Screwy

In this new age of high technology and sophisticated computers I have always tried to stress with my children the importance of tools and how to use them for the rest of their lives. I have always told them that they should know the name of every tool, what it is used for, how it should be cared for, as well as choosing the right tool for the job. I feel that many teen-agers won't know a screwdriver from a socket wrench when they graduate high school.

One day when my 19-year-old daughter was home from college she told me the screws in the console of her car were coming loose and needed to be tightened. After I went and got my screwdrivers, I asked what type of screwdriver she needed. "A small Phillips screwdriver will do fine," she said. I handed her the screwdriver, and I was so proud of the fact that the knowledge I had given her about tools was finally coming to use.

It was then that she blew it. With the screwdriver in hand she asked, "Which way do I turn it?" Once again, I felt that I had failed as a parent. **PW**

*Joe Brock
Collierville, Tennessee*

Coming next issue...

- Build a famous 18th century tool box for 20th century tools
- Make a dead-on accurate miter sled for just \$35
- Learn the easiest way to put razor-sharp edges on your tools
- Build our country spice cabinet in a weekend

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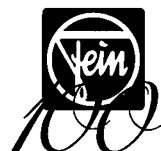


Why buy just a "detail" sander when the FEIN "Triangle" Sander offers so much more versatility? Sure there are a lot of other sanders that cost less, but none of them have the patented oscillating motion. Our Newest Sander features variable speed control, 20% more power, yet weighs 1/2 lb less than the original FEIN Sander.

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29 PC. FRACTIONAL DRILL BIT SET

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Stand, 6" belt, 9" disc,
open-end wrench, and
hex key wrench

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- Disc speed: 1720 RPM
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- Belt speed: 1280 FPM
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4076

Circle #107 on Resource Directory Coupon

PROJECTS FROM THE PAST

CIRCULAR TREE SEAT

Earlier this century, Delta Machinery published a magazine filled with woodworking

The Delta

Vol. 15,
Issue 5

plans. These magazines are more than nostalgia — the plans are darn good! In the interest of history, we're happy to offer this project from yesteryear.



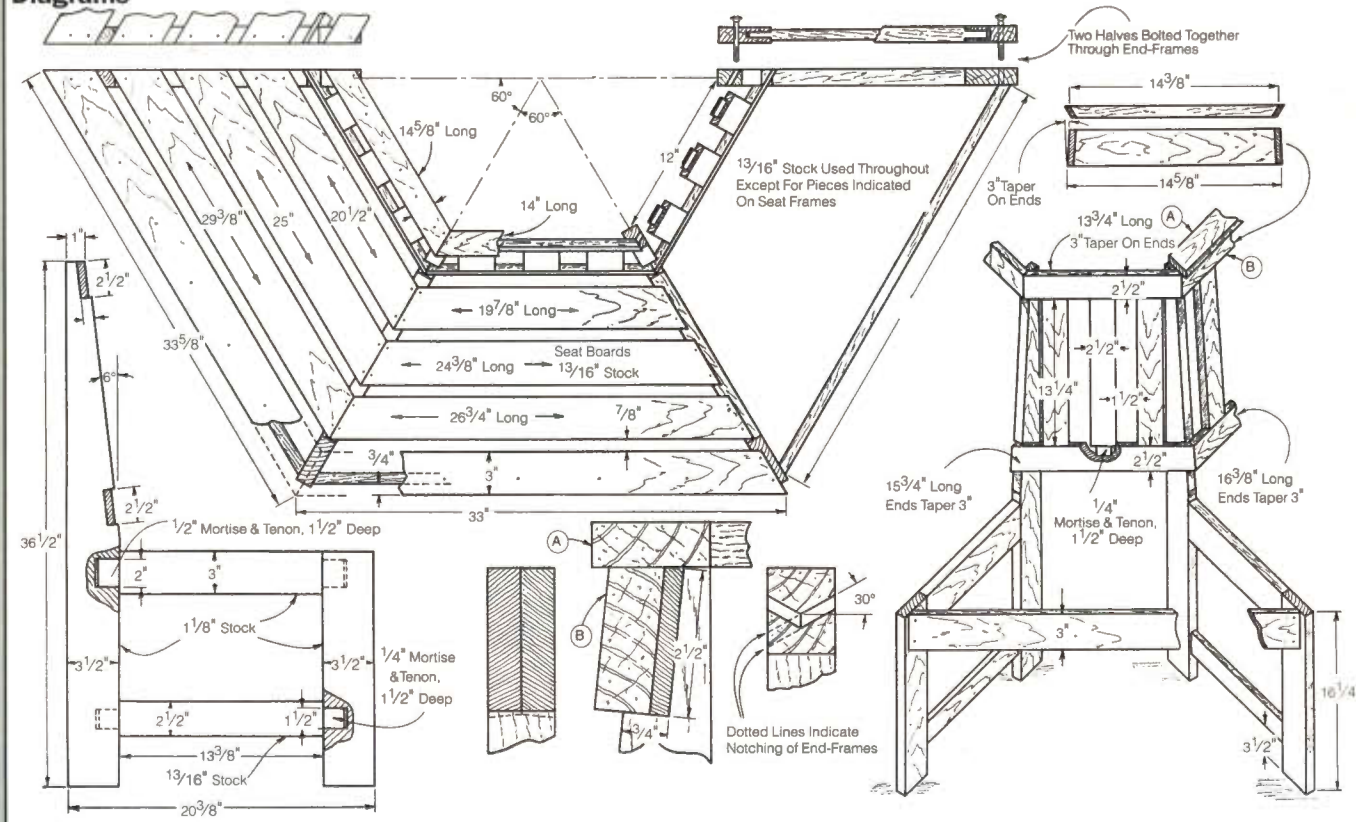
HERE'S a popular addition to your lawn or garden that can be built from a suitable outdoor wood. The seat is made in two sections so you can take it apart and store it in the garage or basement for the winter. The two halves are identical and bolted together with carriage bolts and wing nuts. Assemble each unit with nails and waterproof glue. **PW**



Are we on target?

To see more projects like this in future issues, circle "P1" on the postage-paid card in the Resource Directory.

Diagrams



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Circle #118 on Resource Directory Coupon

Garden Arbor Bench

This simple and stylish project creates a private nook in your garden.

ARBORS have been a part of landscape projects for hundreds of years. They come in all shapes and serve to define a pathway or provide a quiet spot to rest, as well as supporting beautiful vines.

Many of the gardeners I spoke with wanted an arbor as an accent feature or to divide two areas of a garden. The other requirement was a lattice designed into the arbor that would allow a vine to climb. The grid or lattice detail is very important and depends a great deal on the type of vine grown. It's wise to consider the plant's "climbing requirement" before completing your design.





Are we on target?

To see more projects like this in future issues, circle "P4" on the postage-paid card in the Resource Directory.

The arbor was built on site, with the exception of the side grids. They were much easier to fabricate in the shop with a radial arm saw. Pressure-treated lumber was the wood of choice because the structure was being painted (do what you can to avoid breathing the sawdust). You'll notice in the photographs that it's located deep into, and surrounded by, heavy green foliage. If the arbor were painted anything but white it would almost disappear.

There was some concern about permanently anchoring the legs so we decided to use ground spikes (**see photo 3**). This was the first time I've used this method and I was pleased with the results. Of course, if you live in a climate that doesn't experience frost, any support system will be fine. But in Canada, frost three-feet deep into the earth is a fact of life.

Schedule of Materials: Garden Arbor Seat

No.	Let.	Item	Dimensions T W L	Material
4	A	Posts	3½" x 3½" x 84"	Pine
8	B	Vert. grid pieces	1½" x 1½" x 68"	Pine
16	C	Horz. grid pieces	1½" x 1½" x 27"	Pine
2	D	Face boards	1½" x 5½" x 64"	Pine
2	E	Upper side boards	1½" x 5½" x 35½"	Pine
7	F	Roof trusses	½" x 5½" x 47"	Pine
1	G	Frnt seat support	1½" x 3½" x 51"	Pine
2	H	Side seat supports	½" x 3½" x 20"	Pine
2	I	Legs	1½" x 3½" x 6½"	Pine
2	J	Back supports	1½" x 3½" x 16"	Pine
10	K	Slats	1½" x 3½" x 46"	Pine
2	L	Arms	1½" x 3½" x 28½"	Pine
16		Lag bolt sets	¾" x 3"	
4		Ground spikes	To fit the 4 x 4 posts	

ARBOR SEAT



1 GANGED NOTCHES • I used the radial arm saw to make the dados and rabbets on the grid pieces. By using a 1" x 2" piece of stock to lock the members together while cutting, I was able to gang the cuts and reduce the time necessary to prepare the grids.

STEP 1 Notching the Grid Panels • To build the grid panels start by cutting vertical and horizontal pieces to the sizes given in the Schedule of Materials. Clamp the vertical members together and mark layout lines for the $\frac{3}{4}$ " x $1\frac{1}{2}$ " wide notches as shown in the PullOut™ Plans. Then cut the notches using a dado set on your table saw, or on the radial arm saw. Then clamp and mark the layout lines for the horizontal members as shown in the PullOut™ Plans, and cut the $\frac{3}{4}$ " x $1\frac{1}{2}$ " notches the same way as on the vertical pieces.

STEP 2 Assembling the Grid Panels • Begin the assembly process by securing eight horizontal members to the two outside vertical members using 2" outdoor-rated screws. Next, install the two inside vertical members into their corresponding dado joints using construction adhesive and brad nails at all joints.

STEP 3 Preparing the Location • At the site, stake and string a frame pattern to locate the post spikes, forming a rectangle $46\frac{1}{2}$ " x $28\frac{1}{2}$ " to the inside of the posts. Measure diagonally across the frame to ensure the corners are at right angles to each other.

Install the post spikes using a scrap piece of 4 x 4 to avoid damaging the spike. Verify that the posts are both level with each other and plumb, then install one post in each spike. Plumb each post, verify that the rectangular dimension is the same at the top and bottom of the posts, then fasten the posts to the spikes. Temporarily attach cross bracing to the posts to keep them in position while attaching the remaining frame members.

STEP 4 Assemble the Arbor • Start assembling the arbor by securing each grid panel to the posts using 3" screws. Center the frame on the width of the posts and locate the frame so the bottom of the second horizontal member up from the frame bottom is located 15" above the ground.

Next cut a front and rear face board to the size given in the Schedule of Materials. Each face board is clipped at a 45-degree angle on both ends to leave a 2" vertical face at the end. When attached, each extends past the arbor posts by $5\frac{1}{4}$ " on both ends. Temporarily attach them with one nail in each post



2 GRID LOCK • A flat surface large enough to support the entire grid is very useful when assembling the frames. While I used construction adhesive, you may want to consider polyurethane glue, which also is rated for exterior use (see our article on polyurethane glue).

allowing the top edge to overhang the posts' tops by 1". Then level the face boards across the front and to each other.

Now cut and temporarily attach the two upper side boards between and flush to the tops of the front and back face boards. Check that the arbor frame is plumb and the cross boards are level. Once satisfied, install $\frac{3}{8}$ " x 3" lag bolts and washers at each corner. Two per joint are required for a total of 16 bolts.

STEP 5 Attach the Roof Trusses • Cut the seven roof trusses to size. Then clamp the trusses together and mark the two notches as shown in the PullOut Plans. Make the notch cuts the same way you did on the grid pieces.

Center the first truss on the front and rear face, then secure the truss with 3" wood screws from the inside, angling the screw up into the truss. Lay out and mark the location for the rest of the trusses. They should be spaced approximately $7\frac{5}{8}$ " apart. Attach the two outside trusses tight to the outer faces of each post to stabilize the arbor, then attach the remaining four trusses between the outside and center truss.

STEP 6 Make the Seat Frame • To build a simple arbor seat, cut the front support to size. Screw the support to the two grid frames 15" up off the ground. This should place the support in the corner formed by the second vertical member and the second horizontal member of the grid.

Next, cut the two seat supports and the two legs as shown, then cut a 10-degree angle on one end of each seat support, and on one end of each leg. Attach the angled end of each seat support and leg to one another, with the leg to the inside of the support. The leg is flush to the angled end and top edge of the support. Attach the leg assembly to the rear of the front support and the back post, forming a right angle to the inside of the seat.

Now cut the two back supports and place each on top of, and flush to, the rear of the seat supports. Then screw the back supports in place against the rear posts. Since the seat supports have a 10-degree drop, the back supports will have a 10-degree rear slant.

Lastly, the 10 seat and back slats are cut to size and secured to the seat supports, front support and back supports with $\frac{1}{8}$ " spacing. Start by attaching the top back slat, then work down and forward, attaching the front seat slat last.



3 LIKE THE RAILROAD • The post spikes made solidly locating the posts pretty simple. The spikes also keep the wood from coming in contact with the ground to keep rot as far away from the project as possible. Other options would include using concrete footing pads, or digging a hole and pouring concrete around the posts. (The posts need to be extended at least 18" to make this last process work.)



5 PORTABLE NOTCH-MAKER • With the roof trusses clamped together and the notch locations marked, I made multiple passes with my circular saw to cut the notches. A saw guide clamped across the trusses to make the defining cuts on the notches is very helpful. From there the eyeball works well to guide the waste removal.

STEP 7 Arming Your Arbor • We decided to add two simple arms to our bench. The back edge of each arm is chamfered at 10 degrees to match the back slant. The front end was rounded over with a belt sander to make it more user friendly. Secure the arms to the grid members at a comfortable height with screws through the grid and bench back slats.

The arbor is now complete. However, if you are going to leave it unpainted, it would be wise to dress all the exposed wood cuts with pressure treated end-cut treatment. If you plan to paint the arbor, do it as soon as possible so that all open cuts in the pressure-treated wood are protected. **PW**

—Danny Proulx

About the Author

Danny Proulx is the author of "Build Your Own Kitchen

Cabinets" (Betterway Books) and the owner of Rideau Cabinets in Russell, Ontario. This project and many others will be featured in his forthcoming book, "Building Outdoor Furniture," to be published in January 1999 by Popular Woodworking Books.

The book will be one of the featured selections in the WoodWorker's Book Club. Call 800-937-0963 to join (513-531-8250 outside the United States).

ARBOR SEAT



4 BEST FACE FORWARD • With the grid frames in place, the front and rear face boards are temporarily attached. Squaring and plumbing the arbor will make attaching the seat much easier.



6 HAVE A SEAT • With the front, seat and back supports assembled and in place, the slats are spaced $\frac{1}{8}$ " apart from the top of the back down and to the front of the seat. As often happens in a woodworking project, it's a good idea to lay out the slats to make sure the spacing works as planned. It also lets you put the best side of the slats facing up.



7 ARMED AND COMFORTABLE • The arms are easy to attach to the grid frame once the seat is complete. Though I specified a 10-degree chamfer to give you a level arm, you might want to test that angle to see what fits your needs and comfort level.

TRADITIONAL BLANKET CHEST

This blanket chest is sized so it won't look like a shoebox when it sits at the foot of a king- or queen-sized bed. I used soft maple and lucked into a few pieces of curly maple, which I used for the front.

To save time and money, I used birch plywood for all of the interior panels and the bottom. The real trick to using plywood in this project is to make it look like you used solid wood. The best way to do this is to take a hard look at your plywood before you begin cutting out the panels. Find the seams in the veneer on the face of the board. Mark them with a pencil and cut your panels so these seams run down the middle of each panel. This wastes some plywood, I know. But it makes your panels look like you book-matched two resawn boards to make the panel. It's a nice effect.

STEP ONE: Cut your pieces to size according to the Schedule of Materials. Cut the grooves, tenons and rabbets for all the case pieces on your table saw. Assemble the front and back frame-and-panels first. Let the panels float in the

grooves in the rails and stiles without glue. Clamp and let dry. Assemble the sides similarly.

STEP TWO: Cut the stopped groove for the bottom on all four sides and finish the groove with a chisel. Assemble the case with #20 biscuits and glue. Clamp and let dry.

STEP THREE: Glue the support blocks in the corners of the bottom and pilot drill for the bolt that fastens the bun feet. Screw the bun feet into the blocks.

STEP FOUR: Glue up the panel for the top. Clamp and let dry. Mortise the piano hinge into the top and case. I used a straight bit in a router that was attached to an edge guide. Attach the hinge and top temporarily to the case.

STEP FIVE: Rout a profile on your moulding that goes on the underside of the lid (I used a roundover bit in a router). Miter the moulding pieces and nail them to the top, leaving a $\frac{1}{8}$ " gap between the moulding and the case. The moulding hides any gap between your lid and case. You can use glue on the front piece of moulding, but I don't recommend using glue on the side moulding pieces. When your top expands it will destroy

the bond. Now temporarily attach the lid supports to the sides and top.

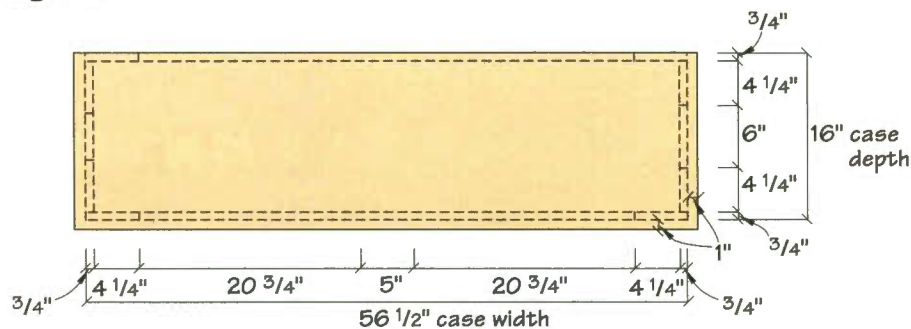
If you plan to sit on this blanket chest regularly, attach two battens to the underside of the top. The battens should be about $\frac{3}{4}$ " x 5" x 12" and should be screwed to the top with the holes in the battens reamed out to allow for wood movement in the top.

STEP SIX: Remove the hardware and finish sand all the pieces to 220. If you are going to use a water-based dye like I did, be sure to raise the grain of the wood using a damp rag and then sand again to the final grit. This will help control blotching. To color the wood, I used J.E. Moser's Golden Amber Maple aniline dye (available through Woodworker's Supply 800-645-9292). To get the color shown in the photo, dilute the dye twice as much as recommended on the package. Rag or spray the dye on your piece, then immediately wipe down the wood. Finally, add two coats of clear finish, sanding between coats. Reattach the hardware and rub out the finish using a fine abrasive pad and steel wool wax that's been diluted with water. **PW**

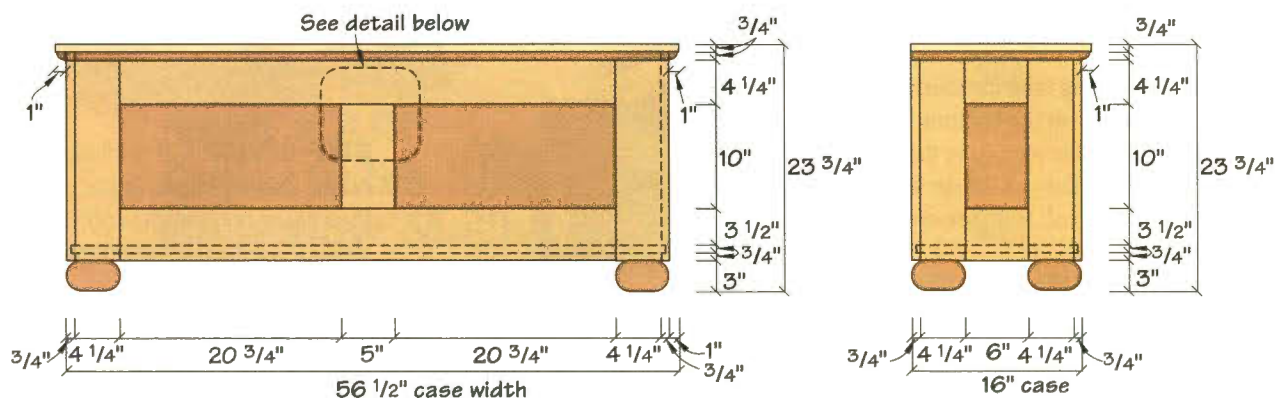
— Christopher Schwarz, PW staff



Diagrams



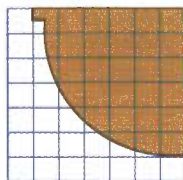
Plan



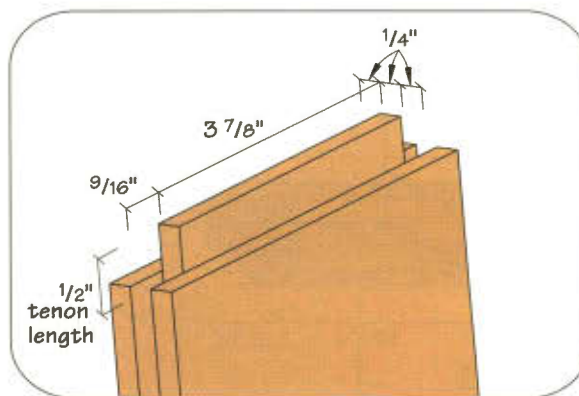
Elevation

Profile

Each square equals $\frac{1}{8}$ "



Full-size detail of lid moulding



Detail of center stile tenons and grooves

Schedule of Materials: Blanket Chest

No.	Item	Dimensions T W L	Material	Notes
1	Top	$\frac{3}{4}$ " x 17" x $58\frac{1}{2}$ "	Maple	
4	Front & back rails	$\frac{3}{4}$ " x 5" x $47\frac{1}{2}$ "	Maple	$\frac{1}{4}$ " x $\frac{9}{16}$ " groove inside edge/ $\frac{1}{4}$ " x $\frac{1}{2}$ " tenon on ends
4	Front & back stiles	$\frac{3}{4}$ " x 5" x 20"	Maple	$\frac{1}{4}$ " x $\frac{9}{16}$ " groove inside edge
2	Center stiles	$\frac{3}{4}$ " x 5" x 11"	Maple	$\frac{1}{4}$ " x $\frac{9}{16}$ " groove on edges/ $\frac{1}{4}$ " x $\frac{1}{2}$ " tenon on ends
4	Large panels	$\frac{1}{2}$ " x $10\frac{1}{2}$ " x $21\frac{1}{4}$ "	Birch ply	$\frac{1}{4}$ " x $\frac{1}{4}$ " rabbet on all edges
4	End rails	$\frac{3}{4}$ " x 5" x 7"	Maple	$\frac{1}{4}$ " x $\frac{9}{16}$ " groove inside edge/ $\frac{1}{4}$ " x $\frac{1}{2}$ " tenon on ends
4	End stiles	$\frac{3}{4}$ " x $4\frac{1}{4}$ " x 20"	Maple	$\frac{1}{4}$ " x $\frac{9}{16}$ " groove inside edge
2	Panels	$\frac{1}{2}$ " x $6\frac{1}{2}$ " x $10\frac{1}{2}$ "	Birch ply	$\frac{1}{4}$ " x $\frac{1}{4}$ " rabbet on all edges
1	Bottom	$\frac{1}{2}$ " x $15\frac{1}{4}$ " x $55\frac{3}{4}$ "	Birch ply	in $\frac{3}{8}$ " x $\frac{1}{2}$ " rabbet $\frac{3}{4}$ " up from bottom
4	Support blocks	$\frac{3}{4}$ " x 4" x 4"	Maple	glued into corners on bottom of chest

• $8\frac{1}{2}$ feet of $\frac{3}{4}$ " x $\frac{3}{4}$ " moulding

• Lee Valley Tools 800-871-8158 • $1\frac{1}{2}$ " x 3" piano hinge, item #00N01.06, \$17.95 • Lid supports, item #03K20.06, \$3.95 pair

• Adams Wood Products 423-587-2942 • four bun feet, item# A0550-HB, maple, \$7.10 each

Are we on target?
To see more projects like this in future issues, circle "P8" on the postage-paid card in the Resource Directory.

Noah's Ark

This simple traditional folk toy is made from one 10 foot 2 x 6 and one 12 foot 1 x 8. The animals all store in either the hold space, or in the cabin.

STEP ONE: Cut the hull pieces to size according to the Schedule of Materials, then make the "ship's hold." From the center of each piece, mark the 3" x 10" notches on each piece, then notch.

STEP TWO: Glue the four levels together. Start with the top level upside-down. Then glue and nail the second and third levels, ending with the fourth level spaced evenly on the bottom.

STEP THREE: Use the pattern in the PullOut™ Plans to mark out the deck shape. Then cut the hull to shape on a band saw.

STEP FOUR: Make the top look like a deck by scoring parallel lines using a screwdriver and straight edge. Then, using the same PullOut pattern, mark and cut the railing halves to match the deck shape. Glue the railing in place.

STEP FIVE: Shape the hull using a belt sander and random orbit sander.



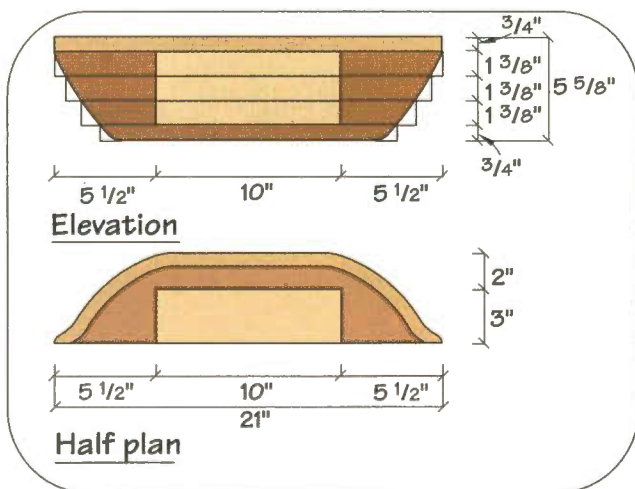
STEP SIX: Cut the cabin walls to size, then form a $\frac{1}{2}$ " x $\frac{3}{8}$ " rabbet on the bottom outside edge of each wall. Next mark and cut the end walls to form the peak. Assemble the cabin with the floor flush to the bottom of the rabbet.

STEP SEVEN: Cut a 25-degree angle on the mating edges of the roof halves, then mark and cut the roof supports to shape. Glue the roof supports to the roof halves as shown.

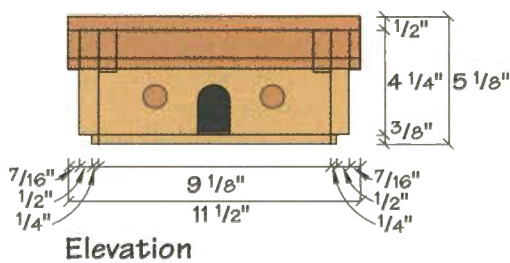
STEP EIGHT: Add portholes as you like. I stained the hull section and painted the cabin and roof. I purchased pre-cut unpainted animals; if you're feeling more artistic than me, scroll saw your own shapes. **PW**

—David Thiel, PW staff

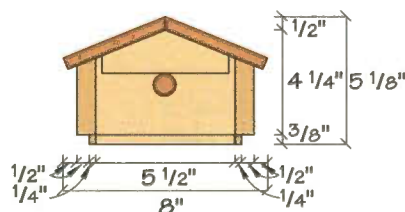
Diagrams



Detail of Ark Hull



Elevation



Profile

Schedule of Materials: Noah's Ark

No.	Item	Dimensions T W L	Material
2	1st level	1 $\frac{3}{8}$ " x 5" x 21"	Pine
2	2nd level	1 $\frac{3}{8}$ " x 4 $\frac{3}{4}$ " x 20"	Pine
2	3rd level	1 $\frac{3}{8}$ " x 4 $\frac{1}{2}$ " x 18"	Pine
1	4th level	$\frac{3}{4}$ " x 7 $\frac{1}{2}$ " x 15 $\frac{1}{2}$ "	Pine
2	Railing	$\frac{3}{4}$ " x 5" x 21"	Pine
2	Cabin walls	$\frac{3}{4}$ " x 3 $\frac{1}{2}$ " x 10 $\frac{5}{8}$ "	Pine
2	Cabin walls	$\frac{3}{4}$ " x 4 $\frac{5}{8}$ " x 5 $\frac{1}{2}$ "	Pine
1	Cabin floor	$\frac{3}{4}$ " x 5 $\frac{1}{2}$ " x 9 $\frac{1}{8}$ "	Pine
2	Roof halves	$\frac{1}{2}$ " x 4 $\frac{1}{2}$ " x 11 $\frac{1}{2}$ "	Pine
2	Roof supports	$\frac{3}{4}$ " x 1 $\frac{3}{4}$ " x 5"	Pine

Animal set available from Cherry Tree, (800) 848-4363. Item #41-172, \$19.95.

Are we on target?

To see more projects like this in future issues, circle "P10" on the postage-paid card in the Resource Directory.

DANCIN' MAN

I remember that my grandfather used to have a toy like this around the house and he would delight us all by making it dance on his knee — almost as if by magic.

I don't know where he got these toys, but I did learn the secret to making them work. Here's how: You put a narrow piece of 1/4" plywood on your knee, hold it down with your elbow and tap on it with your fingers. The man appears to magically dance.

I made the one shown here to look like a carpenter. I also made one that I painted to look like a cowgirl. I call that one a line dancer.

All you really need to build this toy is a coping saw, a rasp, a drill and some sandpaper.


STEP ONE: Rough out the parts by using the templates provided in the PullOut™ Plans. Cut the notches in the torso and thighs that will receive the leg parts. **STEP TWO:** Now cut the tenons on the thighs and lower legs. Be certain that the parts swing freely when placed in their notches. Attach the thighs to the torso using dowels that are glued to the torso but not the thigh's tenon. Attach the lower legs to the thighs in the same way.

STEP THREE: Drill clearance holes in the arms and screw or pin the arms to the torso. Put a washer between the arm and torso to allow for movement.

STEP FOUR: Glue the nose and hat to the head. Sand, paint and add two tacks for the suspenders. Drill a 1/4" hole about 1/2" deep into the center of the back and glue the dowel in place. **PW**

— Edward Coombs

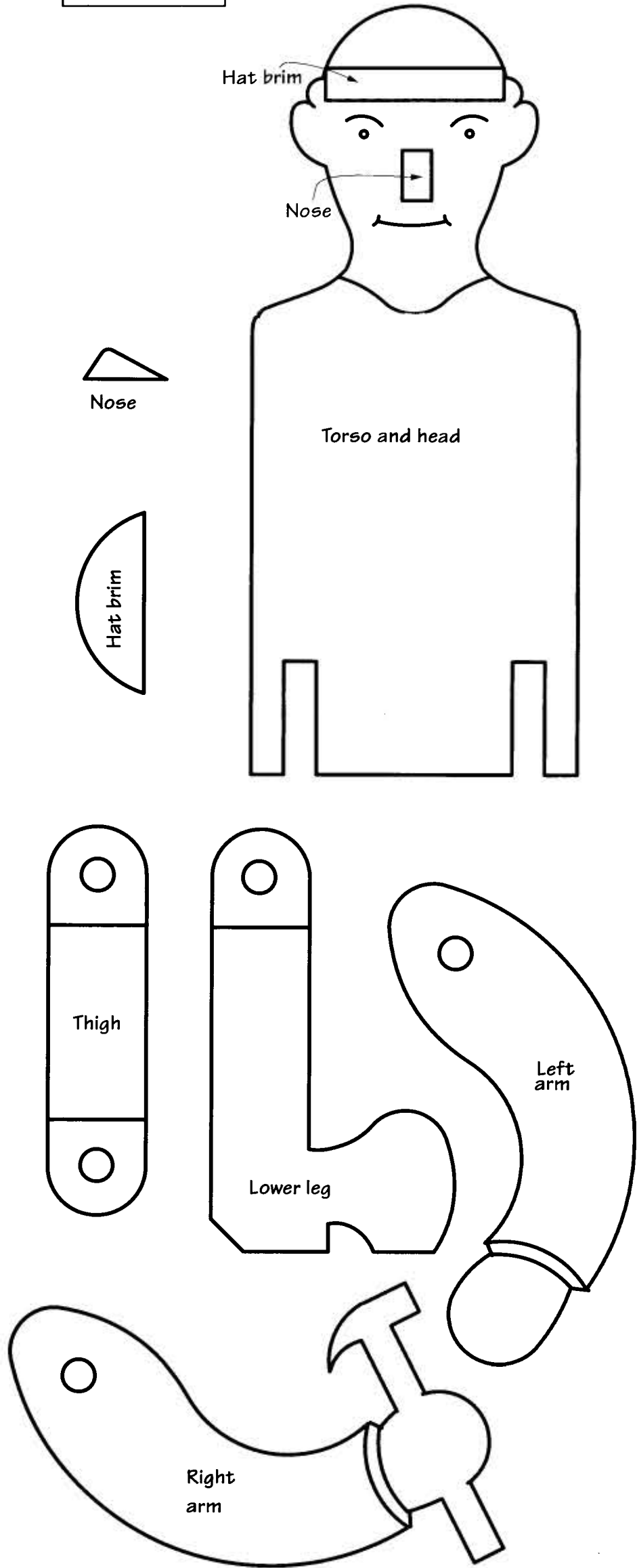
Schedule of Materials: Dancin' Man				
No.	Item	Dimensions T W L	Material	
1	Torso	3/4" x 2 1/2" x 6"	Scrap	
2	Arms	1/2" x 2 1/2" x 4"	Scrap	
2	Thighs	3/4" x 3/4" x 3"	Scrap	
2	Legs	3/4" x 1 3/4" x 3 1/4"	Scrap	
1	Nose	1/4" x 1/4" x 3/4"	Scrap	
1	Hat brim	1/4" x 1/2" x 1 1/2"	Scrap	
1	Dowel	1/4" x 15"	Scrap	
1	Dance floor	1/4" x 3 1/2" x 28"	Scrap	

**Are we on target?**

To see more projects like this in future issues, circle "P13" on the postage-paid card in the Resource Directory.

Dancin' Man

Full-size diagram of body parts



Popular Woodworking

Carefully open staples to remove plans, then bend staples closed again.

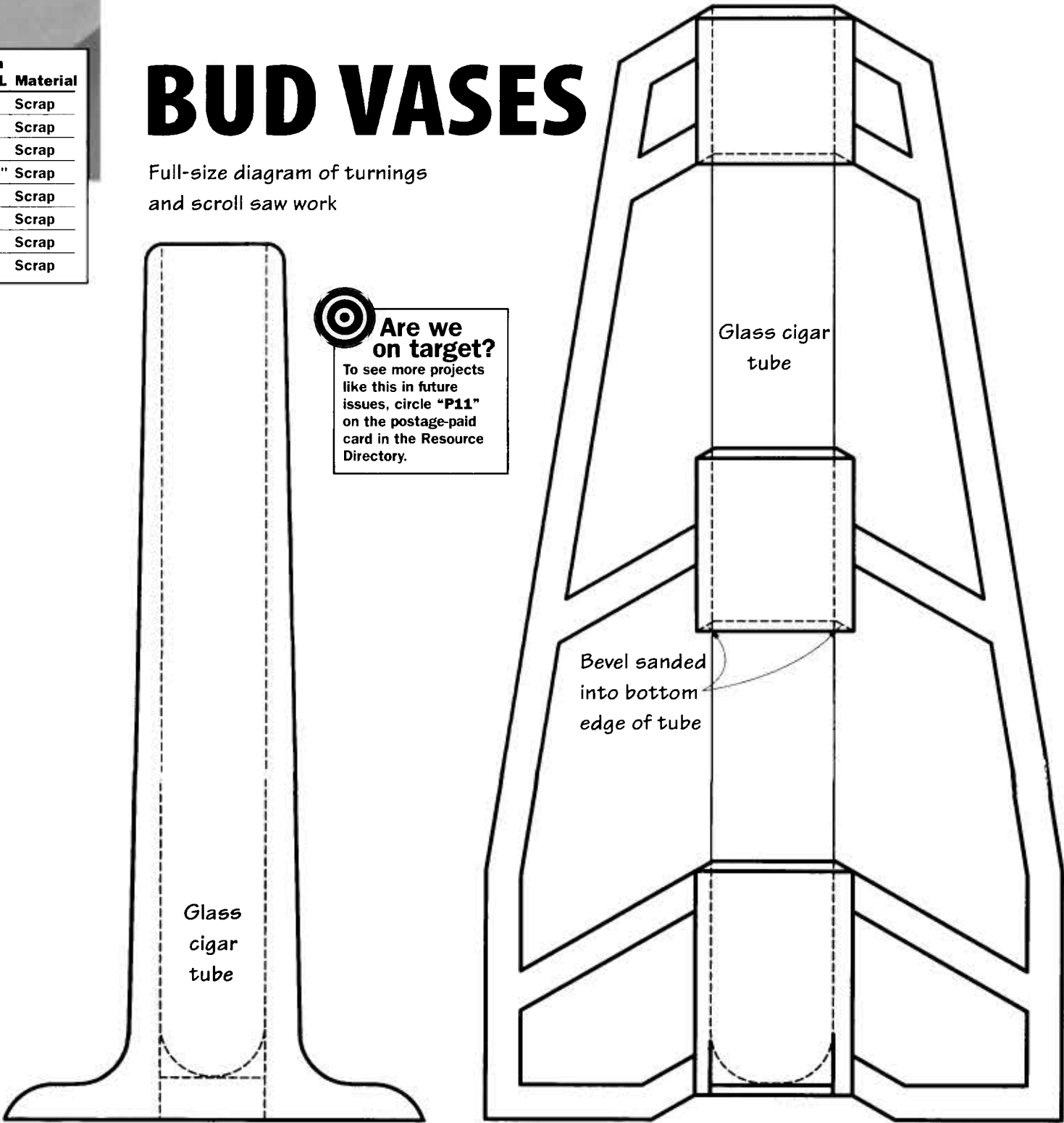
Supplemental drawings for projects in this issue


Project name	From page
Garden Arbor	30
Noah's Ark	36
Collectibles Shelf	47
Bungalow Mailbox	48
Dancin' Man	Inside
Bud Vases	Below

These plans incorporate pages 37 to 44 of this magazine

BUD VASES

Full-size diagram of turnings and scroll saw work



**Are we on target?**

To see more projects like this in future issues, circle "P11" on the postage-paid card in the Resource Directory.

My wife has a thing for keeping fresh-cut flowers in the house. Admittedly they smell good, but for most situations, a large, wedding-present vase just won't do. That's where these two bud vases come in. These vases are simple turnings that support old cigar tubes. Many cigars come in glass tubes, which is dandy for turners to ply their craft.

FRAME VASE

STEP ONE: Begin by cutting a 1 1/2" dowel to 5" in length. Drill the hole for the tube and fit bungs to the holes (bungs are wooden stoppers inserted into the holes that allow you to chuck the piece into your lathe). Mount the blank in the lathe and remove material until it has a wall thickness of 1/8". After sanding, remove the blank and cut it into three sections of 1 3/4", 1 1/4", and 1 1/8" in length. Mark the top of each piece and sand a 30-degree chamfer on each rim.

STEP TWO: Make three copies of the pattern for the frames. Take a piece of figured wood at least 1" thick and resaw three pieces to make three 1/4"-thick parts. Joint a straight edge on these pieces and attach the patterns using rubber cement. Scroll saw the frames out of the three pieces and sand both sides and the edges, inside and out. Use a Dremel-style tool with a small sanding drum to hollow out all of the attaching ends. This will give a better fit on the tubes.

STEP THREE: Attach the frames at 120-degree angles to each other with cyanoacrylate glue. Location is not critical. You are just trying to make a tripod. Clean the excess glue and then cut a small chamfer on all of the edges of the frames to soften the vase's look.

STEP FOUR: Using a small artist's brush, apply aniline dye stain to the vase. I used a primary color and it might take more than one coat to get the desired color. Make sure to do a test piece! Finish with three coats of clear finish.

WALNUT VASE

STEP ONE: Glue up a turning blank out of 1 1/2" x 1 1/2" stock. My glass cigar tube was 6" long, so I made the center piece about 6 1/2" long. To build the base of the vase, glue two 1 1/2" cubes to two opposite sides of the bottom of the tall blank. Make sure the grain runs parallel to the tall blank. After the glue dries, flush up the joints with a block plane and glue two more blocks to the remaining sides of the center blank. When this dries, glue triangular corner blocks that have been cut from corner to corner on a band saw. After this has set for the better part of a day (you don't want it flying apart on the lathe), drill a hole that is 1/32" larger than the tube completely through the blank. I used a over-sized spade bit ground for this.

STEP TWO: Using a scroll chuck, first turn two bungs to fit the hole in the blank. Insert the bungs into the turning ends and chuck them up in the lathe. Begin turning from largest diameter to the smallest. Always be aware of the wall thickness of the long section. I generally use a parting gauge and calipers to set the wall thicknesses on the ends and the middle of the turning. Get this information from the drawing below. After achieving the desired form on the lathe, sand the piece. Finally, spray three coats of clear finish on the vase. **PW**

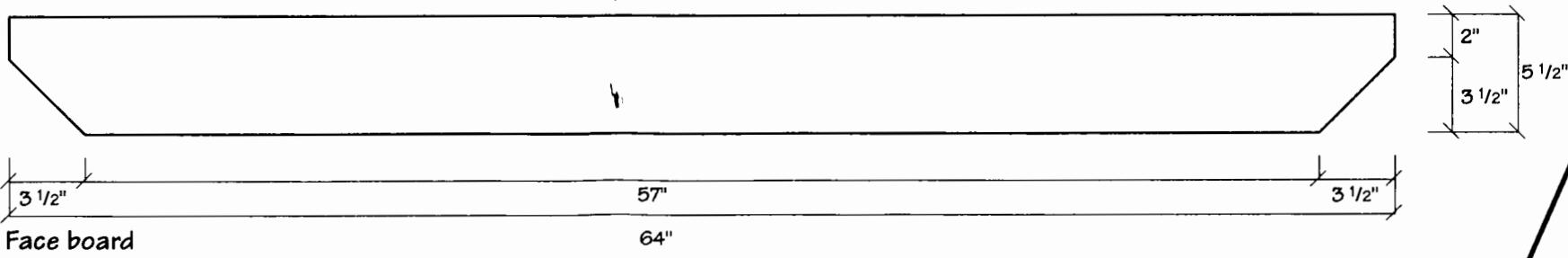
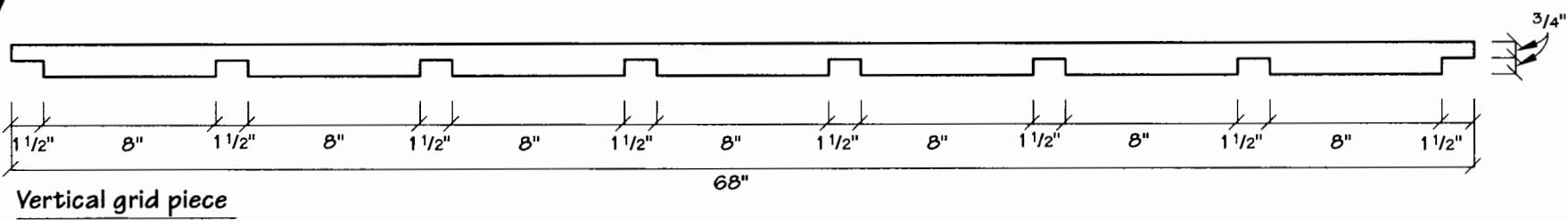
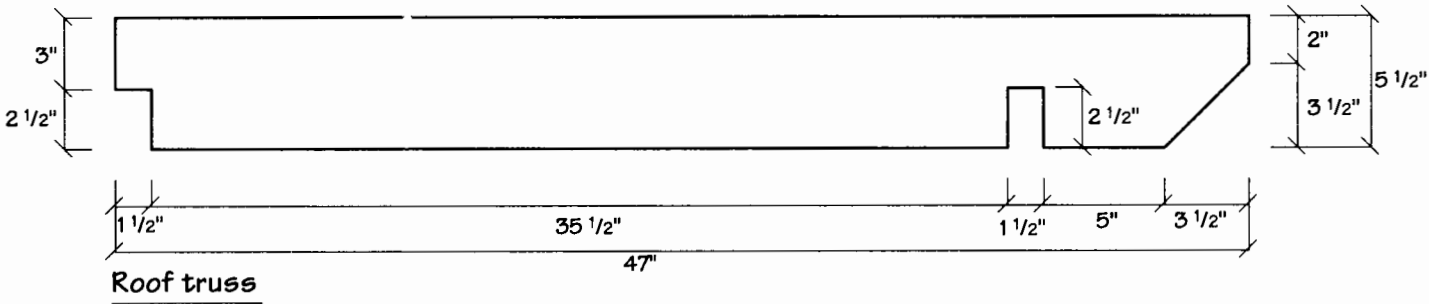
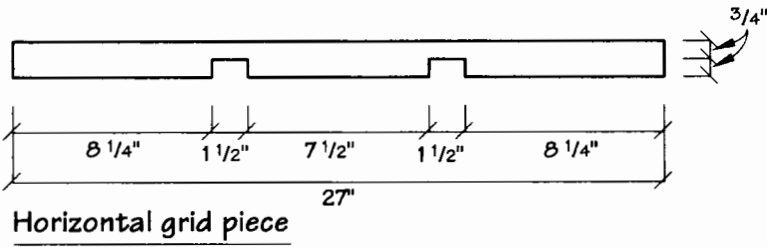
—Jim Stuard, PW staff

Noah's Ark

Full-size diagram
of hull outline
and railing pieces

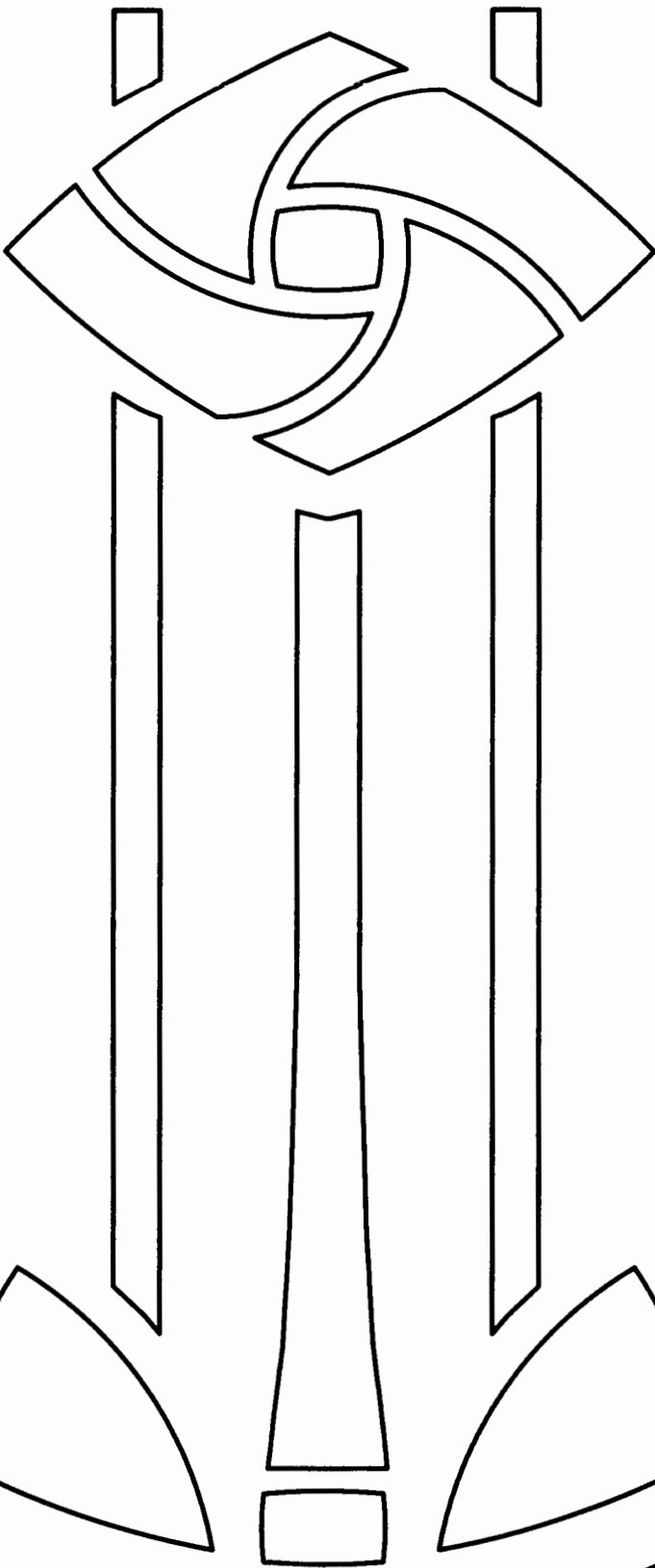
Garden Arbor

Scale diagrams of all notched parts



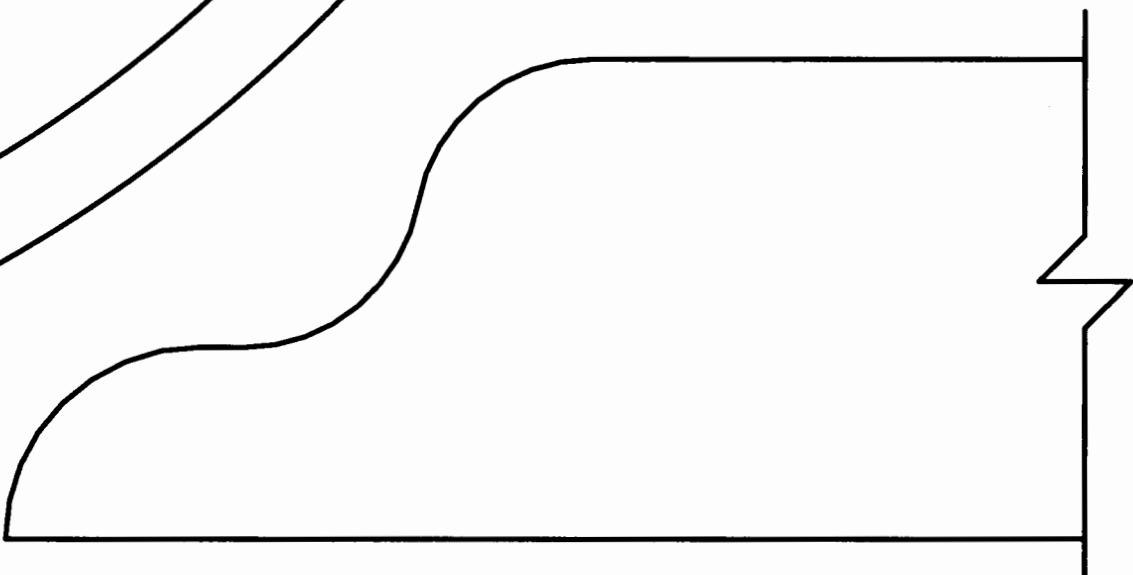
Bungalow Mailbox

Full-size diagram of
rose and stem/leaf
parts



Collectibles Shelf

Full-size diagram of lower end
of side



Casserole Carrier

Whenever I go to a potluck or some other type of status-testing social gathering, my wife makes me hold the casserole. Her crab stew can be hot, so to save my hands, I made this caddy.

STEP ONE: Start by gluing up the top board. After the top has dried, sand and cut it to size. Use a $\frac{1}{2}$ " roundnose bit mounted in a router table to raise the panel for the top. There should be a $\frac{1}{4}$ " thick edge on the panel when finished.

STEP TWO: To capture the top and bottom panels, cut two $\frac{1}{4}$ " x $\frac{1}{4}$ " grooves in the full length of a board $7\frac{5}{8}$ " wide and about 52" long ($\frac{1}{4}$ " in from each edge). Square the board and cut it into four 12" sections. Cut a 45-degree miter on each end of the four panels. Biscuit the miters. Glue up the box with the panels captured in the grooves.

STEP THREE: When the glue dries, sand the outside and cut it into two pieces according to the diagram. Finish sand and attach the hinges and catch. The other hardware can be attached later.

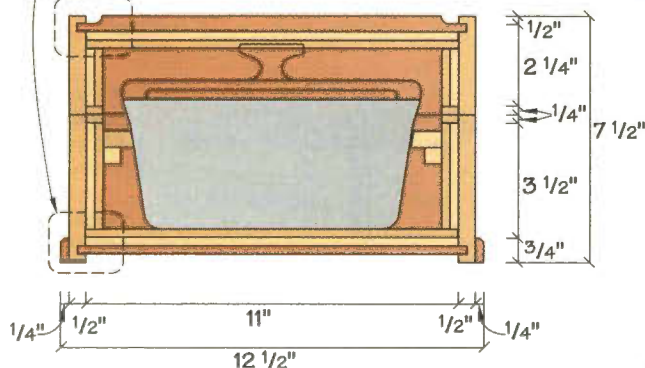
Diagrams

See details at right

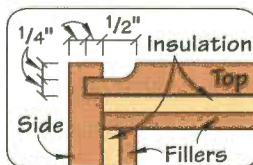


Are we on target?

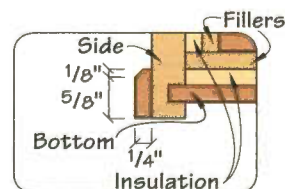
To see more projects like this in future issues, write "Casserole Carrier" on the postage-paid card in the Resource Directory.



Elevation cross section



Detail of top profile



Detail of base moulding

STEP FOUR: Assemble the fillers by gluing solid edging to the plywood panels. After this is dry, attach the insulation to the outside of the panel. Miter the fillers to fit into the box top and bottom. When the insulation and plywood top and bottom filler panel are installed, the side fillers should be about $\frac{1}{8}$ " shy of the meeting edge of both box parts. Cut the casserole holder panel to a press fit according to the Schedule of Materials. Test the fit of the casserole pan in the box and cut a small depression in the top to receive the lid handle to keep it from sliding around in transit.

STEP FIVE: Remove the hardware and apply three coats of clear finish. After the last coat of finish, attach the hardware and insert the insulation, panels and

fillers. Attach the risers in the lower box section and set the casserole holder in place. **PW**

—Gus Bergquist and Jim Stuard

Schedule of Materials: Casserole Carrier

No.	Item	Dimensions T W L	Material
1	Top	$\frac{1}{2}$ " x $11\frac{1}{2}$ " x $11\frac{1}{2}$ "	Walnut
1	Bottom	$\frac{1}{4}$ " x $11\frac{1}{2}$ " x $11\frac{1}{2}$ "	Plywood
4	Sides	$\frac{1}{2}$ " x $7\frac{5}{8}$ " x 12"	Walnut
4	Upper Fillers	$\frac{1}{4}$ " x $1\frac{3}{4}$ " x 11"	Plywood
4	Lower fillers	$\frac{1}{4}$ " x $3\frac{1}{4}$ " x 11"	Plywood
4	Filler insulation	$\frac{1}{4}$ " x $1\frac{3}{4}$ " x 11"	Insulation*
4	Filler insulation	$\frac{1}{4}$ " x $3\frac{1}{4}$ " x 11"	Insulation*
2	Insulation panels	$\frac{1}{4}$ " x 11" x 11"	Insulation*
2	Up. and lo. panels	$\frac{1}{2}$ " x 11" x 11"	Plywood
2	Filler panels	$\frac{1}{4}$ " x 11" x 11"	Plywood
1	Filler trim	$\frac{1}{8}$ " x $\frac{1}{2}$ " x 96"	Maple
1	Casserole holder	$\frac{1}{4}$ " x 10" x 10"	Plywood
4	Risers	$\frac{3}{4}$ " x $\frac{3}{4}$ " x $2\frac{1}{2}$ "	Maple

The casserole dish was made by Corning (6002262).

* $\frac{1}{4}$ " siding Insulation

BEACH TABLE

I love the beach, but I'm not fond of eating sand. To keep the sand out of my sandwich, I decided a little beach table would be appropriate.

Working with scraps, I designed a table that comfortably fits across your lap while you're sitting on the beach, and is easily carried with all your other beach paraphernalia.

STEP ONE: Cut the pieces to size as given in the Schedule of Materials.

STEP TWO: The slats are held in place by tongues cut on their ends which fit into $\frac{3}{8}$ " x $\frac{1}{4}$ " deep grooves cut on the inside of the two end pieces. The grooves' lower edge is $\frac{3}{4}$ " down from the top. Next cut the sides and ends to length by cutting 45-degree miters on the ends.

STEP THREE: Cut the tongues on the slats $\frac{3}{8}$ " thick (check them against your previously cut grooves) and $\frac{1}{2}$ " long.

STEP FOUR: The sides and ends were

assembled with #10 biscuits at the miters to complete the frame. While glue was used on the corners, the slats were set into the notches without glue.

STEP FIVE: While the frame is drying, shape and pre-drill the legs for the fold-down hardware as shown in the manufacturer's instructions. Then mark the location for the leg stretchers, and attach using dowels or nails.

STEP SIX: To position the slats per-

manently in the top frame, space the slats $\frac{1}{2}$ " apart, then peg the tenons with $\frac{1}{8}$ " dowels. Cut the dowels flush.

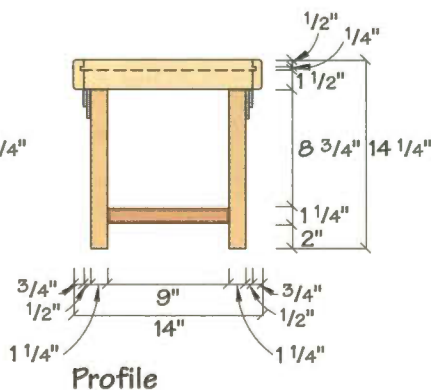
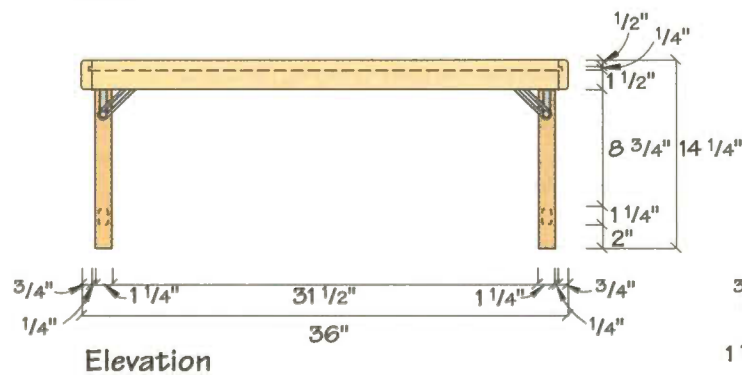
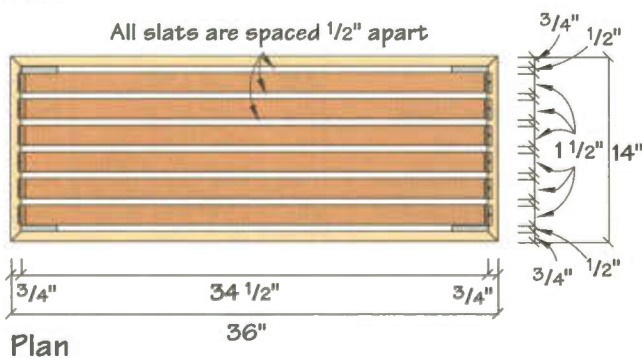
STEP SEVEN: Sand all the pieces, then attach the legs following the instructions on the hardware package. You might find it necessary to use washers to space the hardware from the side for proper clearance.

STEP EIGHT: The table can be left to age naturally without a finish, or can be finished with a weather-safe spar varnish to bring out a more vibrant look. **PW**

—David Thiel, PW staff



Diagrams



Schedule of Materials: Beach Table

No.	Item	Dimensions T W L	Material
4	Legs	1 1/4" x 1 1/4" x 13 1/2"	Ash
2	Stretchers	3/4" x 1 1/4" x 9"	Sassafras
2	Sides	3/4" x 2 1/4" x 36"	Sassafras
2	Ends	3/4" x 2 1/4" x 14"	Sassafras
6	Slats	3/4" x 1 1/2" x 35"	Mahogany

Table leg brackets: sold in pairs by The Woodworker's Store, 800-279-4441, Item #89517, \$14.99 per pair



To see more projects like this in future issues, circle "P9" on the postage-paid card in the Resource Directory.

COLLECTIBLES SHELF



This easy-to-build collectibles shelf can be made with a minimum amount of equipment: a jigsaw, drill, miter box and back saw. If you own a router, you can add an extra detail by routing decorative edges.

This project uses one 8' length of 1 x 3 pine. I stained this shelf with a dark cherry gel stain before applying a water-based polyurethane top coat.

STEP ONE: First cut all the pieces to length. While this is easier on a table saw or a power miter saw, you can also use a simple miter box and back saw.

STEP TWO: Next cut the decorative detail on the sides. Use the design in the PullOut™ Plans or draw your own.

STEP THREE: When both sides are cut out, use a drum sander to smooth out the curves. I used a 1" drum mounted in a drill press.

STEP FOUR: Now make the apron. To lay out the semi-circle detail on the apron, mark a line 2" in from one edge. Next, make a mark across this line in 1 3/4" from each end. Find a large diameter pot lid (about 9 1/2" in diameter) and line it up so the edges of the pot lid meet the two marks you just made. Trace the pot lid, cut the curve and cut off the waste pieces at the edge.

If you want to add decorative edges with your router, do it now. I used a 1/4" piloted roundover bit for the top and sides, and a 1/2" diameter cove bit for the shelves' front edges.

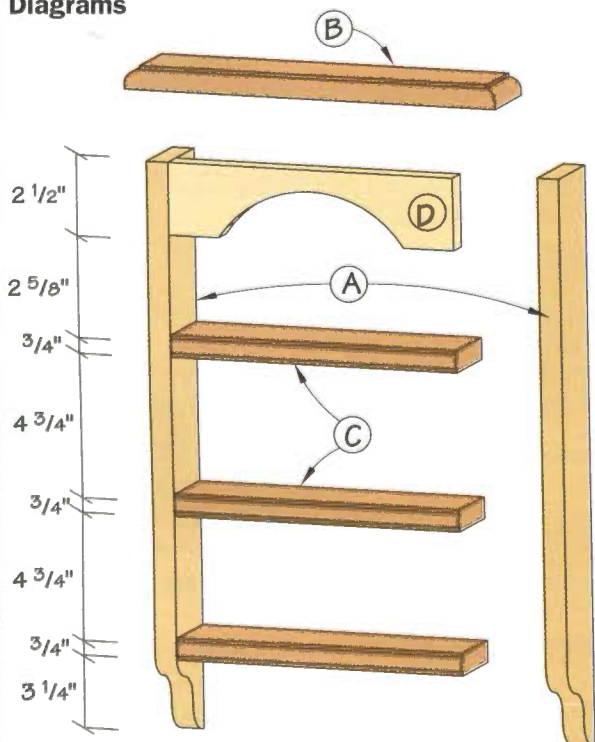
STEP FIVE: Before assembly, measure and mark the position of each screw hole. Starting with the top, measure in 1 1/8" from each end and 3/4" from the front and back edge to find the position of each of the four holes. For the sides, measure 5 1/2", 11" and 16 1/2" from the top and 3/4" in from the front and back edges. The apron is held in place with glue only. Finally, drill the screw holes in the top and side pieces.

STEP SIX: Once all the screw holes are drilled, sand each piece. Start assembly by applying glue to the ends of the bottom shelf piece and screwing the side pieces to it. Check to make sure the shelf is square. Apply glue to the ends of the apron and slip it in place so that it is flush at the top and the front. Clamp it firmly. Finally, attach the top. Glue and screw the top to the apron, but use only screws (no glue) to attach it to the sides. Make sure the top is flush at the front and the side overhang is equal.

Glue plugs in the screw holes. I used walnut plugs to contrast with the pine. Once the glue is dry, apply your favorite stain and at least three coats of finish, sanding lightly between coats. **PW**

—Michel Theriault

Diagrams



Are we on target?

To see more projects like this in future issues, circle "P12" on the postage-paid card in the Resource Directory.

Schedule of Materials: Collectibles Shelf

No.	Let.	Item	Dimensions T W L	Material
1	A	Sides	3/4" x 2 1/2" x 20"	Pine
1	B	Top	3/4" x 2 1/2" x 13"	Pine
3	C	Shelves	3/4" x 2 1/2" x 10"	Pine
1	D	Apron	3/4" x 2 1/2" x 10"	Pine

Bungalow MAILBOX



THIS PROJECT was by request. As I live in the 'burbs and have to walk to the curb to pick up my bills, a mailbox mounted next to my front door would be purely decorative. But a friend lucky enough to have postal delivery right to his door asked if I could come up with an appropriate design for his Arts & Crafts-style bungalow home.

After a little research I settled on a design reminiscent of the work of Charles Rennie Mackintosh. Arguably Scotland's greatest 20th century architect and designer, Mackintosh inspired much of the European Arts & Crafts movement during the early 1900s. A stylized flower motif is found on many of his pieces.

STEP 1 Mostly Glue • The joinery for the box is primarily glue and butt joints, utilizing the long grain-to-long grain orientation of the sides, back and front. The bottom, however sits in a tongue-and-groove joint between the front and back pieces to allow the wood to move.

After cutting the pieces according to the Schedule of Materials, cut a $\frac{1}{4}$ " x $\frac{1}{8}$ " rabbet on the underside of the two long edges of the bottom. This will leave a $\frac{1}{8}$ " x $\frac{1}{8}$ " tongue on the front and back of the bottom (**photo one, left**). Then cut the dadoes on the inside bottom of the front and back pieces by setting the rip fence for $\frac{1}{2}$ " and the blade height to $\frac{3}{16}$ " (**photo one, right**).

STEP 2 Adding the Angles • Now cut the sides of the mailbox on an angle so you can attach the mailbox to your house without cramming a tool inside the box. The sides slope at a 25-degree angle with the front edge measuring 9" tall and the back edge 11" tall.

Now cut the chamfer on the underside of the lid. The front and two sides are chamfered at a 45-degree angle on the table saw, leaving a $\frac{3}{16}$ " flat edge to the top of the lid. The back edge of the lid is cut at a 25-degree angle to mate with the box's back.

STEP 3 Detailing the Back • To add another Mackintosh feature, I cut a four-square pattern centered in the top of the curved back.

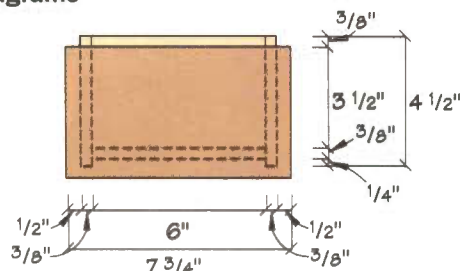
First mark the location of the four-square pattern as shown on the diagram. Use a $\frac{3}{8}$ " drill bit to remove most of the waste from the squares. Then use a chisel and a triangular file to clean up the cuts. To make the curve, draw a 6" radius along the top edge of the back and cut to the mark on the band saw.

1 BOTTOM JOINERY • The bottom fits into the front and back pieces using a tongue and groove

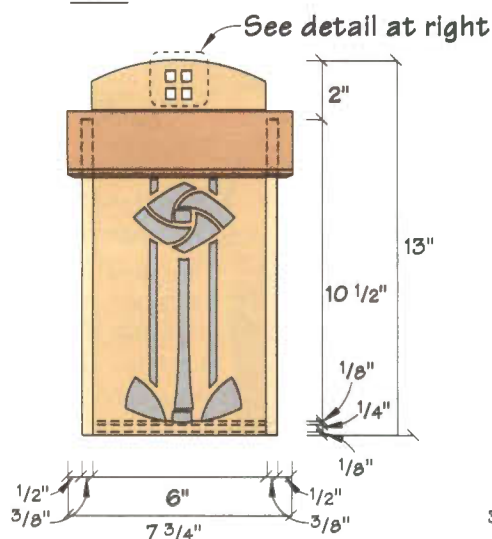
method. The sides are not attached to the bottom, and in fact the bottom is cut to allow a $\frac{1}{16}$ " gap on either side. Should water happen to get into the mailbox, these gaps will allow it to escape rather than pool up in the bottom.



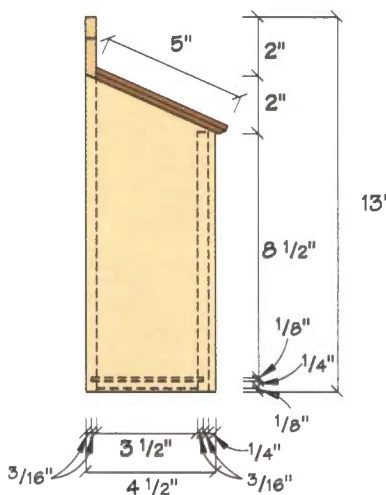
Diagrams



Plan



Elevation

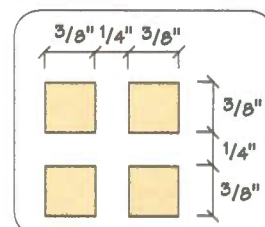


Profile



Are we on target?

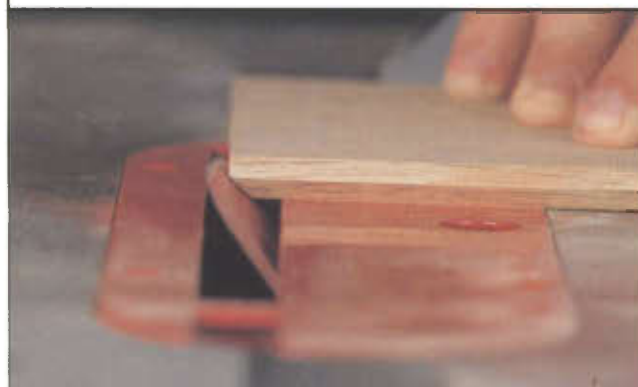
To see more projects like this in future issues, circle "P2" on the postage-paid card in the Resource Directory.



Four square detail

Schedule of Materials: Bungalow Mailbox

No.	Item	Dimensions T W L	Material
2	Sides	3/8" x 4 1/2" x 11"	White oak
1	Front	3/8" x 6" x 9"	White oak
1	Back	3/8" x 6" x 13"	White oak
1	Bottom	3/8" x 3 11/16" x 5 7/8"	White oak
1	Top	3/8" x 5" x 7 3/4"	White oak
1	Applied detail	1/8" x 6" x 9"	White oak
2 - 12" lengths of 3/4" copper pipe			



2 TOP CHAMFER • The top is chamfer cut on three edges, and angle cut on the back edge. By moving my rip fence to the left of the blade, my right-tilt saw is able to make the cuts safely, allowing the waste to fall away from the blade.

After sanding, you're ready to glue up the box. The front is set back 1/4" on the sides, while the back is flush to the back edge. The bottom is left loose in the assembly.

Now cut out the applied detail from 1/8" stock on the scroll saw. A full-size pattern is provided in the Pull-Out™ Plans.

Finishing Touches

Before gluing the flower to the box, stain the box a rustic-looking gray-brown by applying a black aniline dye wash. The wash was made by diluting the dye eight-to-one with denatured alcohol. I then colored the flower and stem pieces with undiluted aniline dye. Attach the flower pieces using cyanoacrylate glue. To



3 FOUR-SQUARE • After drilling the holes, use a 1/8" chisel and a triangular file to clean up the hole. The top left hole is shown after drilling, while the two lower holes have been completed.

finish, use a coat of spar urethane for outdoor protection.

The final tasks are installing a small jewelry box continuous hinge for the lid and the copper magazine hooks. I made the hooks from a couple pieces of 3/4" copper tubing. Flatten the piece with a dead blow hammer, then use a ball-peen hammer to add a dimpled, hand-hammered appearance. I then "antiqued" the copper using a product called Patina Green from a company called Modern Options (415-252-5580). The product quickly adds a nice green patina.

Now screw the two hooks to the back, and the mailbox is ready to hang. **PW**

—David Thiel, PW staff

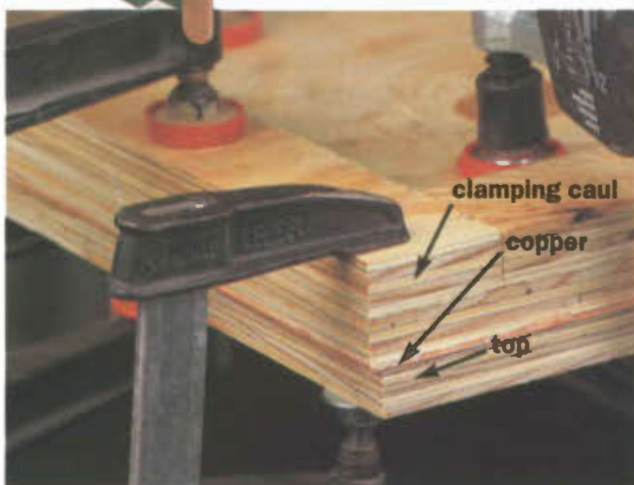
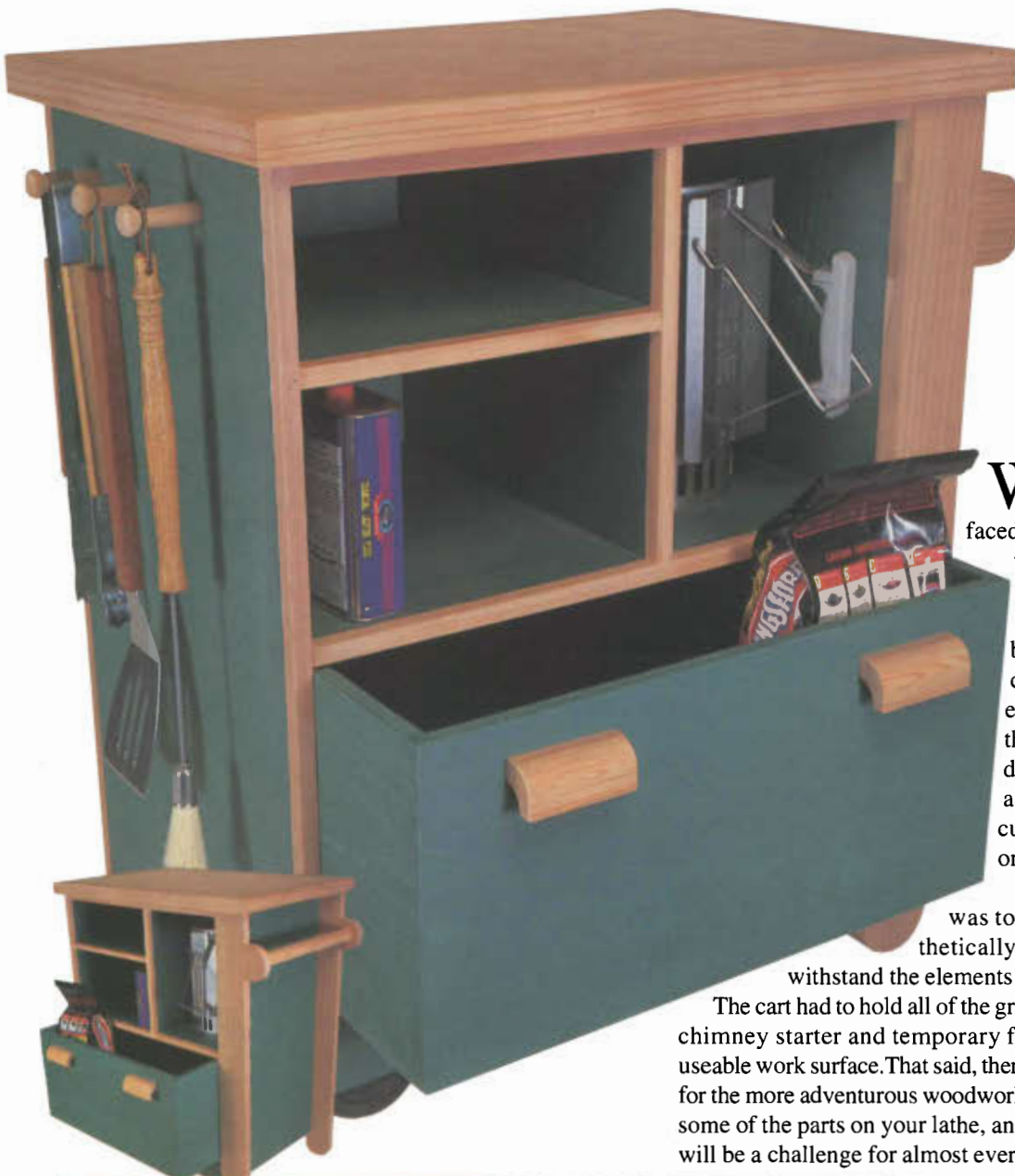
GRILL CART

Get organized for barbecuing season with our mobil cook station.

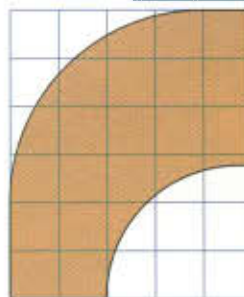
WHENEVER I grilled out last summer, I was faced with entertaining guests while juggling a plate of hamburgers and all the tools of the trade of a world-class barbecuer. This fall, I decided that this was too much, even for somebody who has the patience to grill a well-done hamburger (ughh!). So a suitably appointed barbecue “workstation” was the order of the day.

My goal with this project was to build a functional, aesthetically pleasing cart that could withstand the elements — and was easy to build.

The cart had to hold all of the grilling essentials (charcoal, chimney starter and temporary food storage) and have a useable work surface. That said, there are still some challenges for the more adventurous woodworker out there. You can turn some of the parts on your lathe, and applying the copper top will be a challenge for almost everyone. The CDX plywood



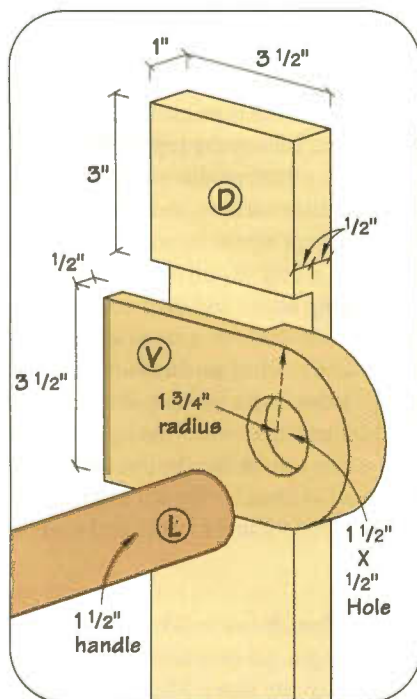
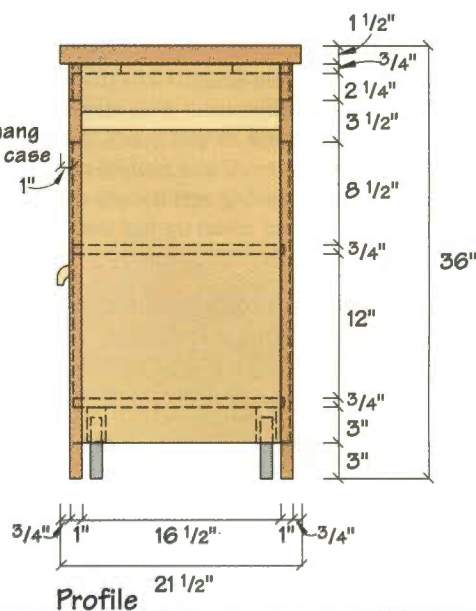
1 MAKE THE TOP • Here's how to clamp the copper while the adhesive cures. Clamp a piece of plywood the same size as the top over the copper. This puts even pressure on it overnight until it dries (left). After letting the adhesive set, it's OK to trim the copper with a router and a laminate trimming bit. After trimming, go ahead and file the copper flush to the plywood's edge and slightly break the sharp edge (right). This makes for a nice joint between the wood and copper.



Are we on target?

To see more projects like this in future issues, circle "P3" on the postage-paid card in the Resource Directory.

Full-size detail of drawer pull



Detail of handle bracket

Schedule of Materials: Grill Cart

No.	Letter	Item	Dimensions T W L	Material
1	A	Top	3/4" x 18" x 28"	Plywood
2	B	Top buildup	3/4" x 2" x 28"	Plywood
2	C	Top buildup	3/4" x 2" x 14"	Plywood
2	D	Legs	3/4" x 3 1/2" x 34 1/2"	Redwood
2	E	Ends	3/4" x 16 1/2" x 31 1/2"	Plywood
1	F	Back	3/4" x 24 1/4" x 31 1/2"	Plywood
1	G	Front apron	3/4" x 3" x 24 1/4"	Plywood
2	H	Big shelves	3/4" x 16 3/4" x 24 3/4"	Plywood
1	I	Small shelf	3/4" x 16 1/2" x 14"	Plywood
1	J	Partition	3/4" x 16 1/2" x 14 1/2"	Plywood
2	K	Rails	3/4" x 3" x 24 1/4"	Plywood
1	L	Crossbar	1 1/2" x 1 1/2" x 17"	Redwood
1	M	Drawer front	3/4" x 12" x 24 1/4"	Plywood
2	N	Drawer sides	3/4" x 12" x 16 1/4"	Plywood
1	O	Drawer back	3/4" x 11 1/4" x 22 3/4"	Plywood
1	P	Drawer bottom	1/4" x 16" x 23 1/4"	Plywood
-	Q	Case trim	3/4" x 3/4" x 16'	Redwood
2	R	Top trim	1" x 1 1/2" x 30"	Redwood
2	S	Top trim	1" x 1 1/2" x 20"	Redwood
3	T	Tool pegs	3/4" x 3/4" x 3"	Redwood
2	U	Drawer pulls	1 1/4" x 1 1/2" x 4"	Redwood
2	V	Brackets	1" x 3 1/2" x 6"	Redwood

The paint used on the project was Benjamin Moore "MoorGard" latex house paint in a low lustre finish.

GRILL CART



2 NAIL THE CASE • Nail the bottom into place and then nail the shelf and partition. Next glue and nail the back into place. The last parts to nail in are the top rails. You will see that where the back and ends meet at the corners, the shelves are sticking out. Simply cut out the corners with a small saw and clean up the cuts with a sharp chisel.

for this project is weather-resistant and takes paint well. The redwood, although pricey, is a great outdoor building material. (Cypress and cedar are less-expensive alternatives.)

STEP 1 Cutting and Painting • Begin by cutting all of the parts according to the Schedule of Materials. In order to make the outside of the case look more finished, I sanded the ends and back until I got a smooth surface. Next, lay out the locations for the $\frac{3}{4}$ " x $\frac{1}{4}$ " dadoes on the case parts. There are two dadoes in the back and the ends, for the bottom and the first shelf. There is an additional dado in one end for the small shelf. See the diagrams for the locations of the dadoes. The small shelf and partition are not dadoed into the back, just each other. Cut the dadoes and lay the parts out on a flat surface for painting.

Before going any further with the cabinet, make the top because the adhesive takes a while to cure. The top for the cart is a sheet of copper sheet metal attached to plywood with redwood edging. The copper is available at most roofing supply retailers. I paid about \$50 for a 3' x 8' sheet of heavy-gauge copper. Another source of supply is to call roofing companies and ask if they have any small unusable cutoffs that will do. It is OK to cover your top with just about any metal laminate. Shy away from plastic laminates because they aren't designed for outdoor use. The most important part of this equation is the adhesive. It has to be able to withstand the movement of the copper and the plywood (however slight). The best solution is to use the butyl caulks used by roofing and window companies. This caulk has an outdoor life expectancy of 20 years, and it will stretch an incredible distance, thereby retaining the strength

Cutting Copper

Sheet copper will cut with a straight edge and utility knife (it's that soft). You also can cut it on a table saw, as long as you take precautions against kickback and don't let it run under the fence. I use an old plastic laminators' trick. Take a piece of $\frac{1}{4}$ " Masonite and cut it to notch around both sides of the fence. This prevents the copper from slipping underneath. When cutting, run the blade only high enough to score the copper. It will easily break in two.



3 MORE PAINTING • I know it's odd to paint a piece before it's completed, but in this case you'll be saving loads of time in cleanup without all of the wood trim in place.

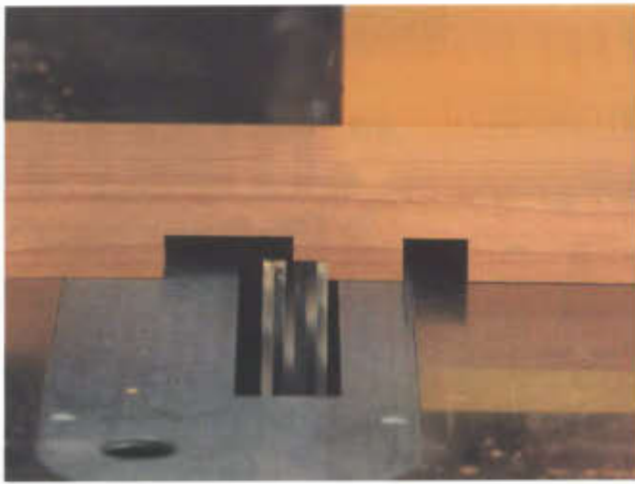
of the bond.

Take the plywood top and attach the buildup to the bottom side with glue and nails. Turn the top over and make sure it is clean and flat. Any irregularities will telegraph through, appearing in the soft copper as bumps. Cut the copper about $\frac{1}{4}$ " larger than the size of the plywood top (See the tip on cutting copper safely). I made a trowel by filing notches in a small piece of copper screwed to a piece of thin plywood. Any trowel designed for laying out floor adhesive will do. Trowel out the adhesive (it should only take about half a tube). Work fast and make sure that there is an even coating of adhesive on the plywood. Lay the sheet copper on the plywood and locate it so there is an even amount of overhang on the top. Clamp the top as shown in the photo. Cut the miters on the wood edging and sand the two outside surfaces and relieve all of the sharp edges, except where the miters meet. Glue and nail the 1" x $1\frac{1}{2}$ " wood edging to the top. Start with the long edges and then attach the short edges.

Paint both sides of all the plywood parts with one coat of an outdoor paint. If you use latex paint, use a brush with synthetic bristles. This keeps the brush from getting too soft and difficult to use. See our paint recommendations in

the Schedule of Materials. Try not to paint the edges because they will have wood glued to them and must be clean to get a good bond.

STEP 2 Make Your Case • When the first coat of paint has dried, begin the case assembly by gluing and nailing the center shelf to the sides. Make sure to use a water-resistant glue. I used Titebond II. When assembling, all the front edges of the ends, shelves and bottom should be flush. The



4 DADOES FOR THE LEGS • To cut the dado, first lay out the outside lines of the dado on the leg. Use as many chippers as you can on the dado setup and begin cutting the two outside dadoes first. Finish by connecting the dadoes. This virtually eliminates tearout on the back side of the cut.

Painting Tip

When painting both sides of case parts, paint the side that will be seen the least and then gently nail four small finish nails or brads into the corners of the wet side while the panel is still wet. You can now flip the panel over and paint the other side without getting any bench crumbs on your work.

shelves should extend $\frac{1}{4}$ " beyond the ends at the back. Make the drawer for the case in the manner you prefer.

STEP 3 Paint it Again Sam • After the case is assembled, go ahead and brush a second coat of paint on it. This will get rid of any thin areas in the finish.

STEP 4 Leg Dadoes • Before you attach the legs you need to cut a $3\frac{1}{2}$ " x $\frac{1}{2}$ " dado to receive the handle brackets. The brackets are notched to fit into the dadoes. Then lastly cut and sand a $1\frac{3}{4}$ " radius on the bottom end of the leg.

STEP 5 Nail the Trim • Attach the trim then fill the nail holes with matching putty. The redwood darkens over time so pick a putty that is a little darker than the sanded wood. Glue and nail the legs into place with the dadoes facing toward the center. Finish the case by attaching the 6" wheels (bought from a hardware store) to the bottom.

STEP 6 Raising the Bar • The handle for the cart is held in place by two brackets. These are notched out $3\frac{1}{2}$ " x $\frac{1}{2}$ " to fit into the space created by the dado in the legs. First take the bracket and cut the notch in one end. On the same side as the notch, lay out a $1\frac{3}{4}$ " radius on the other end.

Nailing Tip

When nailing with an air nailer, or simply by hand, it is best to lay out centered shot lines down the opposite side of the dado. This will guide you when shooting across vast amounts of plywood real estate.



5 ADD THE TRIM • Place the case upside down on a table to attach the trim. Sand the trim surfaces and soften all four sharp edges. Begin gluing and nailing the redwood trim into place. Start from the outside and work your way into the center shelves, fitting pieces as you go.



6 ADD THE ROD • The rod should fit loosely into the holes, so when expansion occurs during the change of seasons, the rod won't crack the brackets. Insert the assembly into the leg dadoes. There should be a snug fit. Screw the brackets into the legs with either galvanized or stainless steel screws.

Don't cut it yet. Drill a $\frac{1}{2}$ " deep hole with a Forstner bit at the radius' center. Now cut and sand the bracket's radius.

For the handle, I glued up a turning blank out of redwood and turned a $1\frac{1}{2}$ " rod. Any weather-resistant dowel stock will do. After fitting the brackets into the dadoes on the legs, take both of the brackets and capture the rod between them. Set the unit on its feet and center the top on the case. Use the same screws as you did for the brackets to attach the top to the case. I turned three tool hanging pegs and attached them to the opposite end from the pull bar. You can buy these pegs from almost any craft store. The profile for these pegs is in the PullOut™ Plans. **PW**

—Jim Stuard, PW staff

THE TRUTH ABOUT POLYURETHANE GLUE

After using this adhesive in our shop for 18 months, we report if the polyurethanes live up to their promises.

AFTER THE COUNTRY'S major glue manufacturers introduced their polyurethane glues at the Chicago Hardware Show two years ago, we came back to our shop here at *Popular Woodworking* excited about trying this new "wonder" product. The polyurethane promise was enticing. We were told that it's stronger than yellow glue, it's waterproof, it fills gaps, it's stainable and it will bond almost any two materials together. The downsides were that it is more expensive, can be messy and it has a shelf life of about a year after the bottle is opened.

After 18 months of use in our shop we were pretty impressed with some of the properties of polyurethane glue. But we weren't sure that the adhesive was living up to all of the hype we read in the catalogs, advertisements and heard from friends. So we talked to the glue experts about their products to see if they could help us separate the science from the stuff you might hear from your woodworking buddies.

First, a little background. It would be a mistake to call polyurethane glues "new." Polyurethanes have been popular in Europe for decades and were first imported to the United States and Canada about six years ago by the Gorilla Group (which sells Gorilla Glue) and AmBel Corp. (which sells Excel). Pretty soon the big glue manufacturers took notice and introduced their own lines of polyurethane glue. So now we have six polyurethane adhesives to choose from — though glue-industry insiders suggest that the polyurethane market is

crowded and that number might soon drop. But that's another story. Here, in a nutshell, is what you need to know about polyurethane glue.

Is it stronger?

Some polyurethane glues advertise themselves as "super strong" and "the toughest glue on planet Earth." Other polyurethane glues don't make any claims about glue strength on the bottle. What gives? Frankly, glue manufacturers seem divided on this issue.

Dale Zimmerman, a technical specialist with Franklin International, which manufactures Titebond Polyurethane Glue, says that his company's tests don't show that polyurethane glue is any stronger than yellow glue. Here's how they tested the adhesives: They glued together 1"-square blocks of hard maple using a long grain-to-long grain joint — the strongest type of glue joint for wood. Then they attempted to break the blocks apart by testing the joint's shear strength, which basically means they tried to break the bond by pushing one block up while pushing the other block down.

And what did they find? Zimmerman says that the joints made by

the polyurethane glue failed around 3,510 pounds per square inch (psi) of pressure. Franklin's Titebond, a popular yellow glue, failed at 3,600 psi. And Titebond II, their exterior-grade outdoor glue, failed at 3,750 psi.

"Polyurethane glues stick well and hold odd materials, but they generally aren't stronger than yellow glues," Zimmerman says. "Yellow glue makes a bond that is stronger than the wood. So while the polyurethane glue might actually be stronger, it doesn't matter because the wood will always fail first. It's not a stronger joint."

Other glue manufacturers disagree. Mark Singer, the founder of Gorilla Glue, says that polyurethane glue is actually stronger than yellow glue when you use it in types of joints other than the one that Franklin International tested. Franklin, he says, used a long grain-to-long grain joint, and that's a joint where traditional yellow glues already excel. Singer says that the real strength of polyurethane glues is in an end grain-to-end grain joint or an end grain-to-long grain joint, which are two joints where yellow glues have always been lacking.

"Shear strength is not polyurethane glue's strongest feature," he says. "In end grain-to-end grain the stuff is incredible. It far outperforms (yellow glues) in end grain. If you coat both surfaces with polyurethane glue, I've seen it (the glue) mi-





grate 2" into wood."

Singer says his company hasn't actually tested this joint scientifically, but he says he's seen tests from Europe and in the United States that confirm this statement.

Zimmerman at Franklin says that his company hasn't tested polyurethanes in this manner either, but it would make sense that polyurethane glue would be stronger in a joint with end grain.

"End grain is like a bunch of soda straws," Zimmerman says. "So they suck up yellow glues, which contract when they dry, and this makes a poor joint." That's not the case with polyurethane glues, which expand as they cure, preventing the end-grain joint from becoming glue-starved and weaker.

Does it fill gaps?

Again, some manufacturers advertise on their bottle that their polyurethane glue "expands to fill gaps" and "expands as it dries," which suggests that the glue plugs gaps much like a two-part epoxy. Unfortunately, this is not the case.

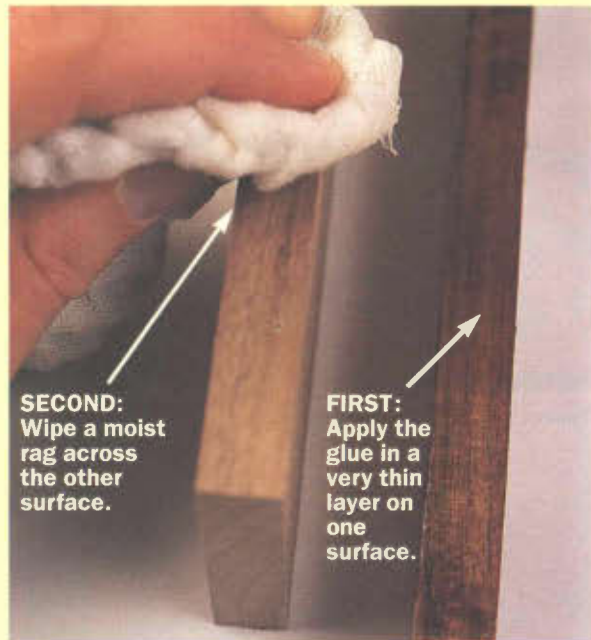
While it's true that polyurethane glues expand as they cure (the squeeze-out actually foams up like aerosol insulation), glue experts agree that polyurethanes cannot fill a gap larger than 1 or 2 millimeters. After a millimeter or two the foam has no strength, so it is merely a cosmetic filler.

"If you look at the squeeze-out there

TIPS ON USING POLYURETHANE GLUE

I'VE PUT THE GLUE ON, WHY ISN'T IT DOING ANYTHING?

Polyurethanes don't just dry, they cure. To be precise, they react with moisture in the wood or in the air to produce a tough bond. If your glue isn't foaming, introduce a little moisture into the joint. In our shop we like to coat one piece of wood with polyurethane glue, and then wipe a little water on the surface it will be mated to.



SECOND: Wipe a moist rag across the other surface.

FIRST: Apply the glue in a very thin layer on one surface.

GOT A BIG ASSEMBLY? GET THE POLY!

If you're putting together a complicated piece of furniture, traditional yellow glue might actually set before you get all your pieces into place. To avoid this frustration, use polyurethane glue, which has a long open time (sometimes as long as an hour) so you can shift parts around until everything lines up.

WHAT ABOUT BISCUIT JOINERY?

If you're going to use polyurethane with biscuits, you might want to dip your biscuits in water before inserting them in your slot. Biscuits normally use the water in yellow glues (which are about 50 percent water) to swell in the slot. Because polyurethane glues need water to cure, it's a good idea to add some water to the joint to help the biscuit swell and the glue to cure.

WHAT SHOULD I DO WHEN THE GLUE GETS A 'SKIN' IN THE BOTTLE?

The glue is fine. What's happened is the top layer has cured by reacting with moisture in the air inside the bottle. Remove the hard layer and the glue below is good to go. If you want to avoid the problem, store your bottle of polyurethane upside down. That way if any glue cures, it will be at the bottom of the bottle.

HOW MUCH GLUE SHOULD I USE?

Almost all the manufacturers tout the fact that you don't need much glue to make a good joint (this helps offset the sticker shock when you see the price on a bottle of polyurethane glue). Here in our shop, we use a flat stick to spread the adhesive as thinly as possible on one of the two mating surfaces. And we still get squeeze-out. Bottom line: a little poly goes a long way.

SO POLYURETHANE IS STRONGER IN SHORT GRAIN. IS THERE ANY WAY TO MAKE MY YELLOW GLUE STRONGER IN SHORT GRAIN?

Yes. The problem with yellow glue is that it is sucked into the short grain and shrinks as it dries. (Polyurethane glue doesn't shrink, it expands.) Here's a trick for making your miter joints stronger with yellow glue: Thin some yellow glue with an equal amount of water. Then brush this mixture onto your short grain. Wait 15 minutes. Then add full-strength glue to your joint's surfaces and clamp. The thin coat you applied first seals the pores of the short grain, preventing the full-strength glue from rushing up the soda straws. PW



Polyurethane glues scrape easily.



They sand easily.



are a lot of air bubbles in there," says Barry Brewer, marketing manager for the DIY channel for Loctite Corp., the manufacturers of Wood Wizard. "Those bubbles are in any of your gaps, so you're not going to get strength from those bubbles. On small gaps, polys fill a gap and make it cosmetically appealing. It's great for the woodworker at home like me. I don't have a planer or a jointer so it's sometimes difficult to get the absolute perfect joint."

"But it will not fill a gap like epoxy," he says. Zimmerman with Franklin International agrees. "We don't make an epoxy at Franklin," he says. "But I tell people that if they are going to repair a wobbly chair, use epoxy because it fills gaps."

Can you stain it?

Every polyurethane glue manufacturer advertises that their glue accepts stain better than yellow glue. This, we thought, was going to be a great feature of the glue. But we've had mixed results with polyurethane glue in our shop

at *Popular Woodworking*.

For example, we used polyurethane glue to assemble the case of the maple Chippendale Secretary featured in the April/May issue. As the polyurethane glue cured, it squeezed out a bit, which is completely normal. We scraped it out of the corners using chisels, cabinet scrapers and sandpaper. We thought we had removed all of the glue. But when we colored the wood with an aniline dye, the areas where the glue squeezed out wouldn't accept stain. In all honesty, however, we've stained other projects built using polyurethane glue without encountering this problem.

The glue experts we talked to say that a couple things might have happened here. Because the glue squeeze-out was in corners, it might have been especially difficult for us to clean out all the squeeze-out and we missed some. Singer, the founder of Gorilla Glue, says it's also possible that the glue sealed the pores of the maple, which is a very tight-grained wood, and prevented the stain from penetrating the wood.

The bottom line, experts say, is that polyurethane glue is much more stainable than yellow glue because it sits on top of the wood and doesn't seal the pores of the wood the same way that yellow glue does.

"Polyurethane glue is not foolproof," says Zimmerman with Franklin International. "But it eliminates the first 90 percent or more

of problems you might have with staining."

So what should you do if you have this problem? Singer recommends using a rag with some lacquer thinner on it to clean up the squeeze-out before it cures. Lacquer thinner thins polyurethane glue and allows you to wipe it up more easily.

Zimmerman says this process is sound, but adds that you should make sure you wipe up the glue using short "rolling" strokes instead of snowplowing your way across the board, which pushes glue into the pores. Another way to keep this from happening is to apply masking tape where your squeeze-out is going to occur. When the glue cures, simply pull the tape up.

Is it waterproof? Does it really stick to almost everything?

Manufacturers say polyurethane glues have excelled in these areas so well that some they are looking





And are more stainable than yellow glues.

to challenge epoxies in the boat-building and home-repair markets.

"Really boat building is a bigger market that poly glues are just tapping into," says Brewer with Loctite. "We've done a lot of testing on this product and can say it is completely waterproof. We don't even have an epoxy in our line that we claim that with."

Elmer's Products, which makes ProBond Polyurethane Glue, has started going after the home-repair market by selling its product in drug stores in 2-ounce sizes for \$3.99, and at that price it has been "flying" off the shelves, according to Elmer's officials.

"That's a great way of getting people to try this product," says Mitch Kon, vice president for marketing at Elmer's. "We're positioning this product as not necessarily a stronger product but as a more universal glue. It will bond almost anything to anything."

In fact, at the Elmer's offices in Columbus, Ohio, employees are proud to show off their ProBond sculpture, which is a towering pile of different kinds of materials — all stuck together using their polyurethane glue.

"It's a single-component glue that's a replacement for epoxy — not a replacement for yellow glue or our ProBond," Kon says. "It's great for that situation where you want to glue a piece of baseboard back into place. You don't think you should use yellow glue, so what do you use? Polyurethane glue will do the job."

Are poly glues here to stay?

Glue manufacturers all say that the public's interest in their products has been increasing steadily since polyurethane glues were introduced in the states. But according to Brewer at Loctite Corp., not everyone is likely to survive.

He says his company estimates the wood glue market is about a \$30 million market per year. Only a small sliver of that is made up of professionals or serious hobbyists — people who are most likely to use polyurethane glues. Most of the glue market is made up of people who need glue for occasional use in their homes.

"There is some growth potential for the product," Brewer says. "But there was a lot of dust raised in the first year these were introduced, so we'll see. Frankly, there just isn't room on the shelf for all these guys."

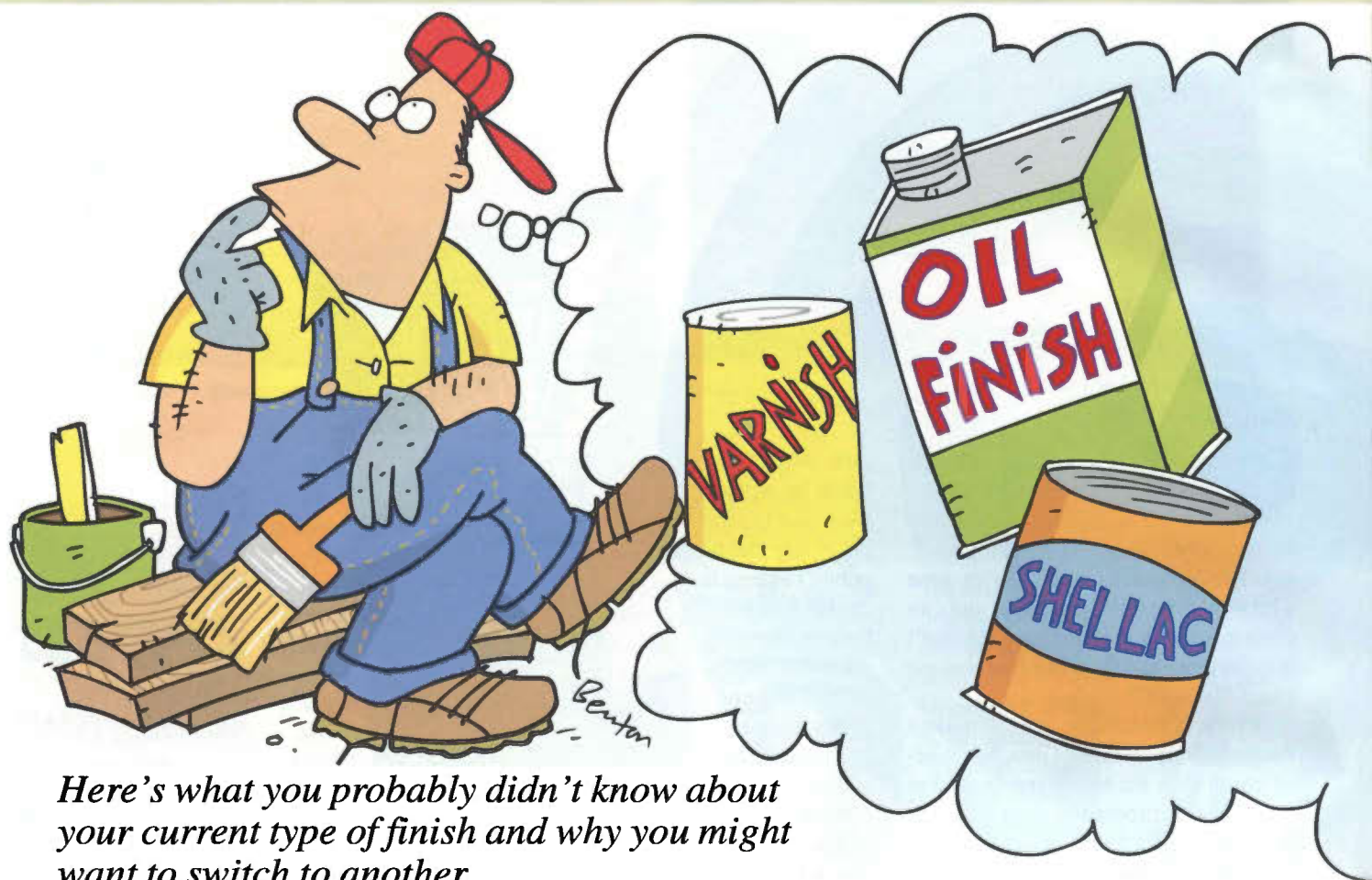
So now all you need to do is decide if polyurethane glues have a place in your heart. Here in our shop we've found a permanent place for the polyurethane adhesives in our glue cabinet — right next to our large supply of good old-fashioned yellow glue. **PW**

— Christopher Schwarz, PW staff



In addition to AmBel's standard poly glue, the company also sells a polyurethane gel adhesive in a cartridge. The gel, called Excel Xpress, has an open time of 5-10 minutes and a clamping time of only 40 minutes.

How to Choose the **BEST**



Here's what you probably didn't know about your current type of finish and why you might want to switch to another.

BESIDES WOOD, glue, sandpaper and stain, the next most often-purchased item for the shop by *Popular Woodworking* readers is polyurethane finish. That fact was really nailed home for me recently when I asked an acquaintance, who just started woodworking a couple years ago, about the finish materials he used.

"When I started," he said, "I used polyurethane."

"Why?" I asked.

"Well," he answered, "I assumed that because everyone else seemed to be using it, it must be good, and it must be easy to use."

So because there are so many polyurethane finishers out there, let's look at that finishing material first. Now I hate to burst your bubble, but the very first thing you need to know is that you're actually not a polyurethane finisher at all — you're a varnish finisher. That's right, varnish. Urethane just happens to be one type of

resin which when cooked with oil, as in linseed oil, combines to form varnish. The other common resin used in modern varnish is alkyd. Long ago, rosin and amber were used, among others. But today, largely because of the mystique of its hardness, polyurethane has become the varnish of choice among home woodworkers.

Like all finishes, polyurethane accomplishes two important goals: it brings out the beauty of the wood while protecting it at the same time. Poly gets good marks for enhancing wood's natural beauty (as do most all film-forming finishes). At the same time, the tough film protects against scratches, heat, water penetration and chemicals.

The finish also gets good scores for ease of application because brushing on two coats will give as much protection as is usually needed. So all these factors make polyurethane the perfect choice, right?

Let's now look at the downside. It does

have what some people call a "plastic look," but that's not so bad. And besides, because the resins used to form the dried film are a plastic (to be more precise, a somewhat cloudy urethane), that shouldn't be such a surprise. Other considerations might be more important to you. Because it is made by combining the resin in oil, and because all oil-based clear finishes yellow when exposed to light and air, the film develops a yellow cast over time.

You also should be aware that polyurethane doesn't stick well to other types of finishes or even to itself. Even when applying a second coat to the first, it's necessary to sand the first coat to promote good adhesion. That's because once dried, a new coat will not dissolve the previous one to reform a thicker, single coat. So the tiny sanding scratches provide a place for the new coat to bite into the previous coat. You also need to sand other finishes before applying polyurethane



over them. And you need to sand polyurethane before covering it with other finishes. In outdoor use, polyurethane separates easily from the wood because the sun's ultraviolet rays destroy the bond.

Poly also takes a relatively long time to dry, which means the chances are greater that airborne dust will contaminate the wet, sticky film. And this problem is compounded by the toughness of the dried film. It's very hard to sand in order to level out the dust, errant fingerprints, craters left from air bubbles or brush marks from applying it.

Lastly, should you ever want to strip it, only the harshest strippers will soften the finish because it is impervious to common solvents such as acetone, lacquer thinner, alcohol, naphtha or paint thinner.

Just about all the attributes of polyurethane discussed above, the good and the bad, can also be applied to what we commonly call varnish. It forms a very

FAMILIES of FINISHES

'Evaporation' Family

These cure by the evaporation of their solvents and thinners.

Shellac • Lacquer

SOLVENTS FOR THE EVAPORATION FAMILY

• Alcohol • Acetone • Lacquer Thinner

ADVANTAGES

- Both form a tough film
- New coats dissolve into previous coats.
- Both dry fast
- Easy to rub out

DISADVANTAGES

- Not as scratch-resistant
- Lacquer is highly flammable
- Liquid shellac has a 1-year shelf life
- Shellac colors the wood a bit

'Reacts With Oxygen' Family

These finishes cure by reacting with oxygen.

- Varnish
- Polyurethane
- Wiping Varnish
- Oil/Varnish Blends
- Tung Oil
- Linseed Oil

THINNERS FOR THIS FAMILY

• Mineral Spirits • Turpentine • Naptha (petroleum distillate)

ADVANTAGES

- All varnishes are very scratch-resistant
- Varnishes are chemical-resistant
- Oils are easy to apply

DISADVANTAGES

- Polys don't stick well to other finishes or to itself
- Oils give little protection
- Polys flake off outdoors
- Polys take a long time to dry
- Must sand between coats

'Water-Base' Family

These finishes "melt" together, or coalesce

- Water-based Varnish
- Water-based Polyurethane
- Water-based Lacquer

SOLVENT • Glycol ether

THINNER • Water

ADVANTAGES

- These don't yellow like poly
- Scratch-resistant
- Chemical-resistant

DISADVANTAGES

- Not heat-resistant
- Dry somewhat slowly

Remember: There's a difference between solvents and thinners. A solvent actually dissolves a material — making it softer, or even changing it back to a liquid. A thinner, on the other hand, merely thins the material and cannot redissolve the substance once it's in a solid state.

LACQUER



A good finish material but impractical for the home shop because it's best sprayed and is highly flammable.

tough film with just a couple brushed coats. And you need to sand between coats to promote adhesion. It too yellows, is scratch-resistant, provides a good barrier against water vapor, enhances the wood's beauty, etc. It also takes a long time to dry, making it prone to dust contamination.

Water-based finishes are not the same

Now let's let another cat out of the bag so that further confusion can be put to rest. Any water-based finish that has the same

BOILED LINSEED OIL



A true oil finish material that's easy to apply but offers little protection and requires routine maintenance.

these finishes cure, or dry. The resins in the water-based finishes are treated so that they sort of "melt" together as the water evaporates from the wet, freshly applied coat. And soon thereafter, the solvent in water-based finishes, glycolether, evaporates as well. What's left behind is the dry, hardened resin.

Some of the characteristics are the same. For example, water-based polyurethane resists scratches and moisture. It also resists chemicals well, but exposing it to heat softens the finish and weak-

ORANGE SHELLAC



Shellac brushes on, dries quickly and is easily rubbed out. Since it forms a film, it also protects the wood.

vent-based lacquer. Furthermore, because they don't contain oil, the finish won't yellow over time, which is a real advantage when finishing light-colored woods such as maple. On darker woods or stained woods, the varnish's yellowing is hardly noticeable, and some would argue that it actually enhances the appearance of the finish over time, giving it a mellower look.

Water-based finishes don't require sanding between coats because the glycolether softens the previous coat to bond with the new coat. However, you must wait several hours between coats so that the previous coat has had time to dry. Otherwise, you risk trapping water in the lower coat that can't sufficiently dry, leaving a cloudy appearance in the finish, sometimes referred to as "blush."

Lacquer and shellac, a finisher's best friends

If you will allow, I'm going to let my personal prejudices show for a moment. Over the years I have used all types of varnishes, including polyurethanes and water-based finishes, and appreciate their special benefits in particular circumstances. I could use them routinely and get good results. But my favorite finishes, without a doubt, are lacquer and shellac. It's not coincidental that both are in the same family of finishes in that they cure, or dry, by the simple process of evaporation.

Unfortunately, lacquer is highly flam-

What about 'SPAR' URETHANE and VARNISH?

Spar varnish and spar urethane, which are used in outdoor applications, have distinct advantages over regular polyurethane or varnish in that their adhesion isn't hurt by the sun's rays. Another advantage is they are combined with a greater amount of oil, which makes the cured finish more flexible so that the wood and the finish expand and contract harmoniously. In case you come across the term, spar varnish is also called a "long oil" finish because of the greater percentage of oil in the varnish. Regular varnishes, including polyurethane, are sometimes referred to as short- or medium-oil finishes.

name as its traditional counterpart — such as water-based polyurethane vs. polyurethane varnish, water-based lacquer vs. nitrocellulose lacquer — is not the same finish at all. As such, you can disregard a lot of the attributes applied to lacquers and varnishes when using their water-based cousins.

The primary difference in the performance of these finishes is the way

ens many of its good characteristic. In practice, water-based polys are not a good choice on counter tops or dining table tops that will have hot casseroles or cups of coffee setting directly on or near the finish.

Water-based products do have the advantage of drying faster than oil-based finishes. And they certainly don't give off the flammable, harsh fumes of oil- or sol-

CLEAR SHELLAC



The cloudiness of clear shellac is in part wax, which impairs its water resistance. The wax can be removed.

mable, gives off a lot of fumes and requires a spray booth to be used safely. It also is best applied with spray equipment, which can be pricey. Because of this, it doesn't fit the needs of the home woodworker. Shellac, on the other hand, can be a good substitute.

Both lacquer and shellac form a tough film and, like all film-forming finishes, enhance the wood's beauty by bringing out the color and giving it depth. The film is not as scratch- moisture- or chemical-resistant as either varnish or water-based products. But it is resistant to heat. Unlike lacquer, shellac uses alcohol as a thinner and solvent, which is much less harmful than the solvents in lacquer, lacquer thinner and acetone.

Because both finishes cure by evaporation and are redissolved by their solvents, one coat can be applied directly over the next and the previous coat need not be fully cured. Both finishes dry to the touch much faster than water-based products or varnish. This not only speeds up the finishing process, but it decreases the chance you'll get dust in the finish. Better yet, even if dust, fingerprints or craters left by bubbles remain after the finish has dried, they can be easily sanded out and the following application of finish will leave no trace of the repair.

Because they are not as scratch-resistant, the finishes can be rubbed out much easier. This means you can produce a beau-

POLYURETHANE



Poly's just a varnish by another name, and it might not be your best bet for an everyday finish.

tiful, deep film finish with just the right luster without spending nearly the time or effort required to produce the same results using varnish or water-based finishes.

While lacquer will not yellow and is usually sold as "water white," meaning it won't color the wood, shellac is usually another story. Most shellac is sold as orange or amber. You see the color in it the minute you open the can or start mixing your own from flakes. Clear shellac is available, which is made clear by a bleaching process. Beware, however, that bleached shellac goes bad faster than unbleached. You'll also see that clear shellac appears milky in the can. This is caused by the presence of wax in all shellac. Although not terrible, the wax in shellac causes it to be less water-resistant. You can remove the wax by letting the wax settle to the bottom of the can. Or, better yet, pour the shellac into a glass jar so you can easily see the wax sediment. Then carefully pour off the shellac, leaving the wax on the bottom.

All shellac in liquid form deteriorates over time. Old shellac won't cure hard and is easily scratched. So to protect yourself, don't use shellac that has been mixed or manufactured more than a year ago. If you buy it premixed in a can, don't buy it unless it has a date of manufacture and you're sure you'll use the contents before a year is up. One way to ensure freshness is by making your own shellac by dis-

FINISHING

What's the BEST finish?

My best advice to anyone with a question about "what's the best finish" is to ask right back if they are satisfied with the results they are getting from the finish they've been using. Yes, there are special situations when you need to change finishes to meet the special condition. Without a doubt, film-forming finishes protect more than oil finishes, but they are also more difficult to apply, and more important, more difficult to master.

If you are just getting started with finishing, try several types — if only on a practice board — to get a feel for how they work. Pick one, then learn to do it well. Learn how to apply it properly, learn when and how to thin it. Learn how to brush it on without too many bubbles or brush strokes. Learn the finish process inside out, then stick with that finish. Consistent, predictable results with regard to both look and performance are key. Then, when you reach a certain comfort level with your "everyday" finish process, you will have the confidence to branch out and experiment with others. Like your woodworking, it takes practice, patience and the development of skills to produce the kind of work you really want to do.

solving shellac flakes in denatured alcohol (shellac thinner).

Most shellac sold in premixed cans is a "three-pound cut," meaning three pounds of shellac were dissolved in one gallon of alcohol. A heavier cut means there's more shellac in a gallon so it will be thicker.

Orange or amber shellac gives the wood a definite color. This can dramatically change the color of a light-colored wood and subtly change a darker color. On darker woods, you can use the color to your advantage.

Oil finishes

Depending on the type of oil finish you select, you might be an oil finisher or, be-

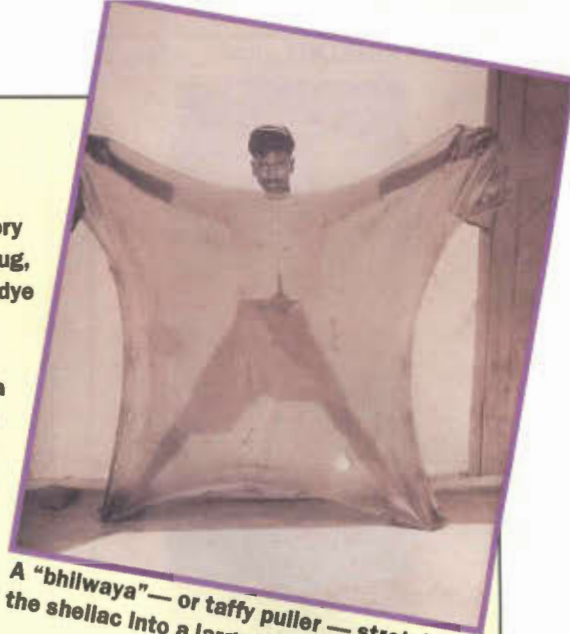
The ODD & FASCINATING Story Behind Shellac

No other finishing product has a story behind it that is as unusual as the story of shellac. This natural resin comes from the tiny red insect called the lac bug, which is common in India and Thailand. Though shellac has been used as a dye for clothing for 3,000 years and for finishing wood for a long time, it wasn't until 1849 that William Zinsser brought the product to the states.

Here's how shellac begins its life as a bug secretion and ends up as a durable finishing product on your furniture: Lac bugs, which are about the size of apple seeds, swarm around certain trees. When they settle on the trees they stick a stinger into the tree and begin sucking the sap from it. This is called the "feast of death" in shellac lore. The bugs process the sap and secrete it as a hard resin that will eventually cover the entire swarm. After six months of eating and making resin, the bugs die. The females' eggs hatch and a new swarm of bugs is born.

Locals gather millions of the encrusted twigs, scrape the resin from the branches and grind up the lac. The lac is soaked in water and a stomper (called a "ghasandar") jumps up and down on the stuff to break open the lac pods, which removes the red dye and insect remains from the material. This material can then be heated and stretched into sheets by hand or with a machine. A chemical process can also bleach the shellac. The sheets are broken into flakes, which can then be dissolved in alcohol to make shellac.

— Taken from "The Story of Shellac" courtesy of William Zinsser & Co. Inc.



A "bhlwaya"—or taffy puller—stretches the shellac into a large thin sheet.

lieve it or not, a varnish finisher once again. A true oil finish uses either pure tung oil (sometimes called china wood oil) or linseed oil. While boiled linseed oil is readily available, pure tung oil is not. By itself, tung oil is only water-resistant after five or six coats have been applied. But after this many coats, it is more water-resistant than linseed oil. And it will not yellow as much as linseed oil. Tung oil also will turn white in the pores of wood where it builds up after fully curing.

All in all, pure oil finishes offer little protection for the wood. They don't offer any real protection against scratches, water vapor exchange or chemicals. They do enhance the beauty of the wood, especially when first applied. But I have found that they require a lot of maintenance to keep the good look over time. They are easy to apply by simply ragging them on. But be sure to remove any excess oil after

HOW TOUGH IS ENOUGH?

All film finishes resist moisture, scratching and chemicals, and the differences among water-based products, varnish (including polyurethane), lacquer and shellac are not significant in most everyday circumstances. There's more to consider in selecting a finish than its toughness. Weigh the toughness against ease of application and the consequences should repairs be needed. It's not just a consideration of selecting the finish you can live with, it's selecting a finish you can work with as well.

the stuff has had time to soak in. Linseed oil left behind will become a gummy mess. Of course, make sure your oily rags are thoroughly aired out and properly disposed of.

Other than pure oil finishes, most other finishes sold as oils are either wiping varnish or oil-varnish blends. Wiping varnish is simply varnish that has

been thinned sufficiently

to wipe on and off easily with a rag. The oil in it is merely the oil used to make the varnish in the first place. The thinning agent is simply mineral spirits. Wiping varnish does protect the wood somewhat, and it helps the wood's appearance. However, it is so thinned down that unless you apply many many coats, the film you apply is so thin that it offers little protection.

Oil-varnish blends are just that: varnish with another or several types of oil added. For example, most finish prod-

ucts sold as Danish oil are an oil-varnish blend. In terms of performance, you get some of the benefits of oil and some of varnish. However, the oil content inhibits the varnish part from curing hard, so you give up a good portion of the scratch- and abrasion-resistance of the varnish. The thin film offers little protection from moisture, chemicals and abrasion.

All in all, oil finishes are not very satisfactory, except for ease of application. They really don't protect well, and they require too much upkeep if you want to keep them looking good. And after all, if you spent the time and made a nice project, why compromise the result with a finish that doesn't protect your project and make it look its best? **PW**

— Steve Shanessy, PW staff

Editor's Note: Bob Flexner's book, "Understanding Wood Finishes," (Rodale Press) was useful in the preparation of this article and for that I thank Bob and the publisher. Bob is a professional finisher who leaped headlong into the deep end to learn all the aspects of finishing, including much of the complicated chemistry. For anyone interested in learning more about the subject, I highly recommend his book—and that you also continue reading this ongoing series of articles on finishing.



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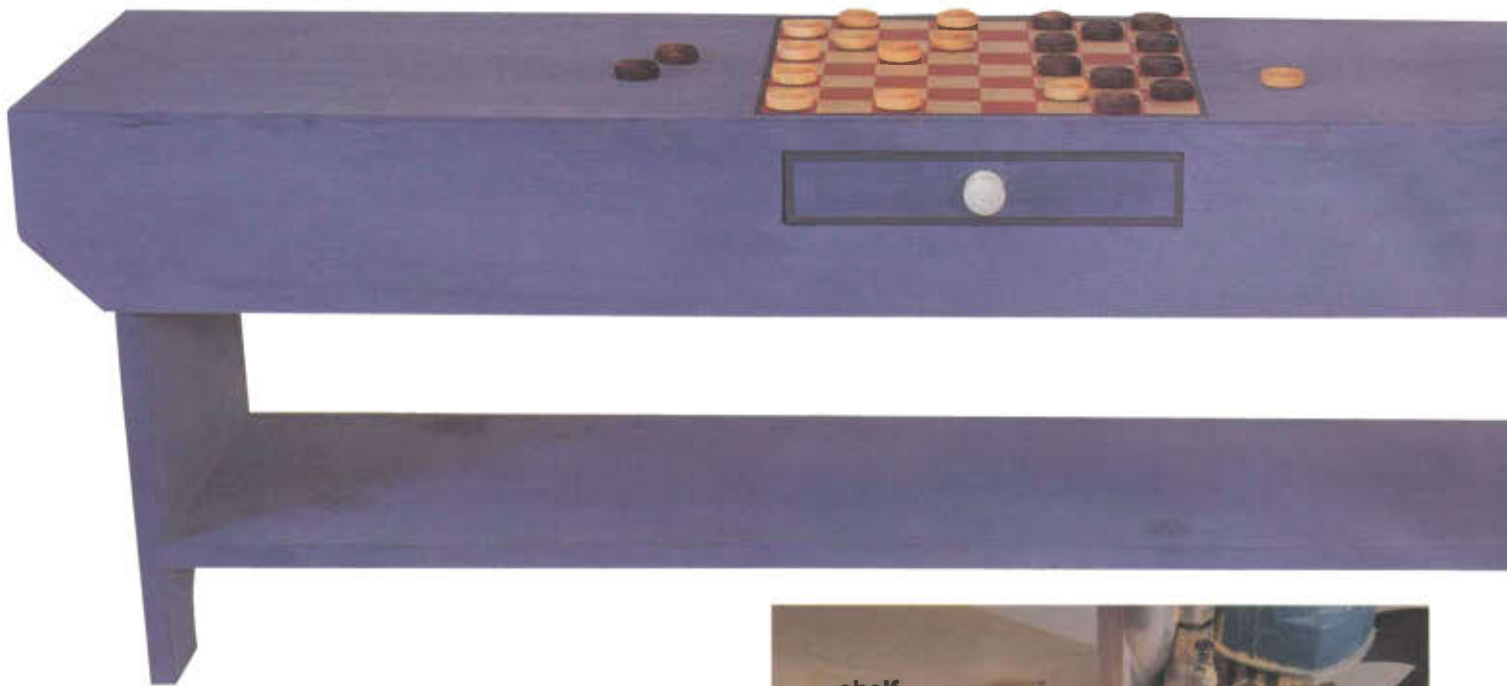
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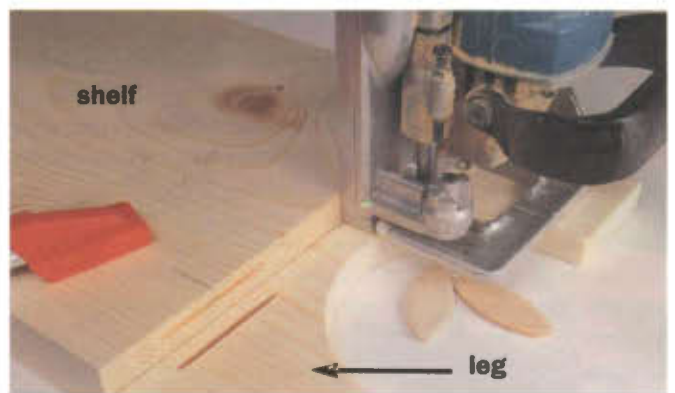
Challenge a friend to checkers or chess — or just sit and watch the world go by.

ONE OF THE MOST beautiful stretches of American asphalt is Highway 11 in South Carolina. There, beneath the unspoiled foothills of the Blue Ridge Mountains, you can buy boiled peanuts at the side of the road and browse through antique shops in old barns and lonely gas stations.

One Sunday my wife and I stopped at an old woman's store that looked like it was going to fall down tomorrow. And among her rusted farm implements and weather vanes was this quaint little bench. She told us it was made by the Mennonites in Pennsylvania and somehow ended up in the northwest corner of South Carolina. Now I'm not so sure I believed the old woman's tale — heck I don't even know if Mennonites believe in playing checkers. But it was a nice bench. So I built one for my family.

You can make this bench with an absolute minimum number of tools: a circular saw, a jig saw, a drill and a few common hand tools. Even better, this bench is easily built with pine 1 x 12s (I built this one with two 10' 1 x 12s. Total price: \$17.98). This bench is a good excuse to buy a biscuit joiner (though dowels work just as well), and I'll show you a trick for these machines that's not in the manual.

STEP 1 Build the Bench • Cut all your pieces to length as shown in the Schedule of Materials. Rip a 1 x 12 in half to make the front and back pieces. Then lay out your clipped corners on those pieces (3½" from the top; 2" in from the side) and cut them with a jig saw. Clean up the cuts with a block



1 BISCUIT TRICK • It might seem tricky to biscuit the shelf to the legs because the fence of the biscuit joiner would get in the way. So take the fence off. Now put the shelf flat on the leg at the exact location where the two will meet. Clamp the two pieces firmly to your bench. Make a mark on the shelf where you want the biscuit to go. Rest the bottom of the biscuit joiner on the leg and cut the slot in the shelf. Now turn the biscuit joiner so the bottom is against the end of the shelf and cut the slot in the leg.



2 CHECKERBOARD • I used an inexpensive paint you can easily find at most craft stores. When masking off the squares, be sure to use masking tape that's intended for painting, otherwise the adhesive will pull up the paint. When the entire board was dry, I rubbed a very light coat of brown glaze over the board to give it an aged look. Be careful not to get glaze on the milk paint or it will turn black.

plane or sandpaper. Now cut the hole for the drawer front. Lay out the location of the drawer, drill enough holes to make space for your jig saw's blade and make your cuts. Clean up the cut with a four-in-hand rasp and sandpaper.

Now make the cutout on the bottom of the legs. Lay out the 3"-radius circle with a compass. Or cheat like I did by tracing around a 6" sandpaper disk. Use a jig-saw to make the cut and clean the edges with sandpaper. Sand all the parts to 150 grit before assembly.

If you're going to use biscuits to assemble your bench, begin by marking the locations for the biscuits. I used biscuits to join the legs to the shelf and the front and back to the top. I nailed and glued everything else together.

Begin assembly by attaching the legs to the shelf with biscuits or dowels. If you're using a biscuit joiner, see the photo caption for a trick that makes this operation a breeze. When you're gluing the legs to the shelf, it's tricky to keep your parts square. So cut a narrow piece of scrap to 42½" long. Place this scrap piece between the top of the legs to keep your bench square while you glue and clamp the legs to the shelf. Next attach the top to the legs with glue and nails, dowels or biscuits. Finally, attach the front and back to the bench using the same method. Clamp everything, clean up your glue squeeze-

out with a damp rag and allow the glue to dry.

Build the drawer in the manner you prefer. You could simply nail the pieces together. Or you could cut rabbets on the pieces using your table saw. I made hand-cut dovetails just for the practice. I cut a groove in the four pieces to capture the ¼" bottom. Assemble the drawer and attach a pull to the front.

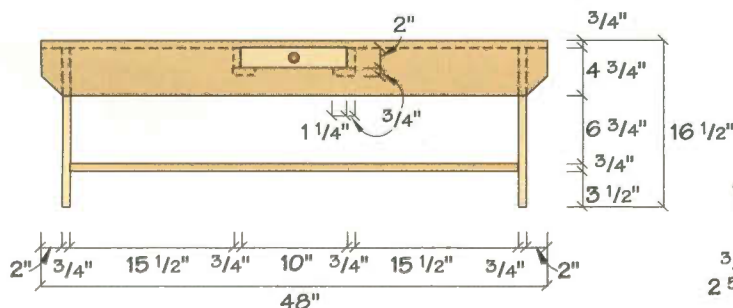
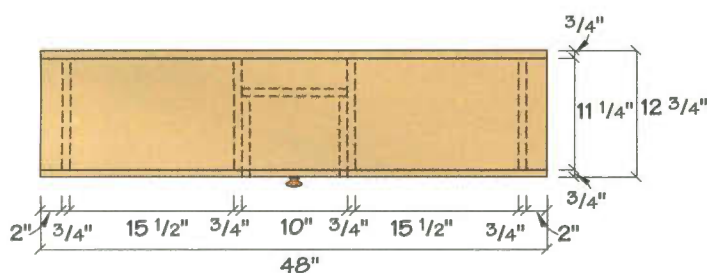
The runners for the drawers are easy. Turn the bench over and nail and glue two of the runner pieces between the front and back pieces, flush to the top. These should also be flush to the sides of the opening for your drawer. Now nail and glue the two other pieces to the first pieces so they make an "L" shape. These second pieces should be flush to the bottom of your drawer opening.

STEP 2 Finishing • This part is more time-consuming than building the bench. I used a blue milk paint for a traditional look (see the Schedule of Materials for a supplier). Once the paint dries, lay out the checkerboard. Mine is 11" square. This makes each square 1⅜" square. (Buy your checkers from a toy store before you begin building. My checkers were 1⅜" in diameter.) Lay out the 64 squares using a steel ruler and a scratch awl. First paint the whole board white. Then paint a ¼" black border around the checkerboard. Finally, mask off half the squares and paint them red.

Remember that this bench is made of pine so it's not going to last if you leave it out in the rain. The bench works best on a covered porch — or even inside the house in the playroom. **PW**

— Christopher Schwarz, PW staff

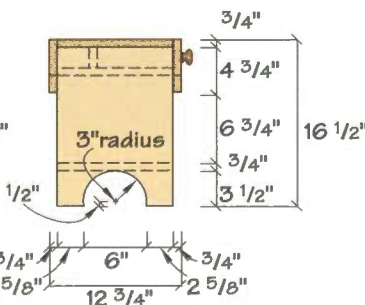
Diagrams



Schedule of Materials: Game Bench

No.	Item	Dimensions T W L	Material
1	Top	¾" x 11¼" x 48"	Pine
2	Legs	¾" x 11¼" x 15½"	Pine
2	Front & back	¾" x 5½" x 48"	Pine
1	Shelf	¾" x 11¼" x 42½"	Pine
2	Drawer frnt & bk	¾" x 2" x 10"	Pine
2	Drawer sides	¾" x 2" x 8"	Pine
1	Bottom	¼" x 7¼" x 9¼"	Ply.
4	Drawer runners	¾" x 2" x 11¼"	Pine

Milk Paint • Constantine's 800-223-8087 • 1 Pint
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To see more projects like this in future issues, circle "P5" on the postage-paid card in the Resource Directory.

PLANTER BOX

THE LITTLE SHOP
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#9
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This indoor/outdoor planter is a cheerful gardening companion.



Editor's Note

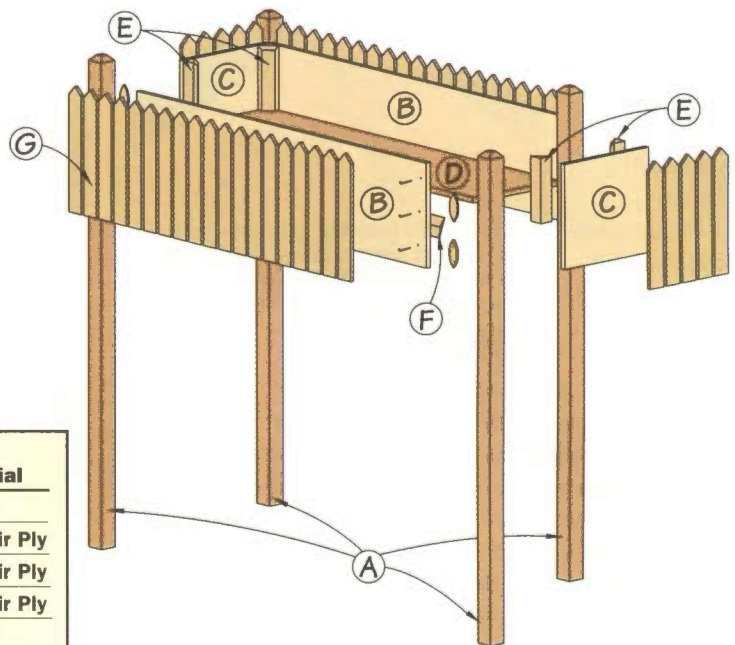
In issue #91, I built this workshop on wheels, which folds in half for storage. Then I outfitted it with \$498 in tools and equipment. Reckoning many of you work in small shops with limited tools, I wanted you to know that we can work that way, too. "Little Shop" projects are designed to be built simply. For a copy of issue #91, send \$4.50 to Popular Woodworking • Back Issues • 1507 Dana Ave. • Cincinnati, OH 45207 • Ask for #58066.

Diagram

Are we on target?
To see more projects like this in future issues, circle "P6" on the postage-paid card in the Resource Directory.

Schedule of Materials: Planter Box

No.	Let.	Item	Dimensions T W L	Material
4	A	Legs	1 1/4" x 1 1/4" x 34"	Poplar
2	B	Sides	1/2" x 7 1/2" x 29"	CDX Fir Ply
2	C	Ends	1/2" x 7 1/2" x 7 3/4"	CDX Fir Ply
1	D	Bottom	1/2" x 7 3/4" x 29"	CDX Fir Ply
4	E	Corner blks	1 1/4" x 1 1/4" x 4 1/2"	Poplar
2	F	Glue blks	1 1/4" x 1 1/4" x 5"	Poplar
48	G	Pickets	1/2" x 1 1/4" x 8 3/4"	CDX Fir Ply



When I bring my plants indoors after a summer on the porch, I've always made do with window sills for their winter home. Not satisfied with this obviously limited solution, I decided to put some scrap material to use and make a planter box with legs. This one looks great inside the house during the winter and outside on the porch in the summer months.

Luckily, I had some leftover exterior-grade plywood for the box and fence picket parts. Some 1 1/4" poplar became the legs. Bear in mind the design is good for 6" pots. You'll need to alter the box dimensions for different-sized pots.

STEP 1&2 Get Jigged Up • Review the drawing and Schedule of Materials before commencing in the shop. If you don't have a satisfactory mitering jig, refer to the accompanying jig project to make one. When you're ready to start, cut out the parts to size.

Were this an outdoor-only project, I would have dispensed with the bead detail on the legs. But because it was going in the house I wanted to dress it up a bit. The leg style I used is one of the hallmarks of a Chippendale piece, although I suspect the 18th century furniture designer would roll over in his grave seeing it in this somewhat frivolous application.

To form the detail, I used a simple trick that works incredibly well—a flathead screw with the head half-sawn off and quickly filed to a sharp edge.

Form the bead by repeatedly pulling the beading "scratch stock" along the edge of the leg until the profile is fully formed. Start the profile about 1 1/2" from one end (the top)



1 SCRATCH STOCK • Make your own scratch stock beading tool in about 10 minutes. Start with a #10 flat-head screw and screw it in the end of a short piece of scrap until the tapered head reaches the wood. Next, hacksaw off half the head from the top of the screw to the wood. Clean up the saw cut with a file, then file the angled edges of the head until you have a sharp edge.



2 CUT YOUR DETAIL • With your beading tool, create the detail on the edge of the leg using repeated strokes along. Use the end of the wood where the screw is attached to guide and index the tool while forming the detail. On this leg, the bead detail was formed on three edges.

Mitering Jig

An accurate miter-cutting jig that's ready to go anytime is worth the time to make. It's not only good for simple operations like the picket tops and faceted leg tops in this project,



The table saw mitering sled cuts both right and left angles. Wood facings are attached to the $\frac{1}{8}$ " x $1\frac{1}{2}$ " angle iron. The facings can be easily replaced when necessary without having to readjust for accurate miters.

but for making picture and door frames, too.

Select a piece of flat plywood, $\frac{1}{4}$ " to $\frac{1}{2}$ " thick. Cut the rectangular piece so that the grain runs in the direction of the miter slots on your table saw. Next cut strips that will fit your miter slots to act as runners on the bottom of the plywood sled. The fit allows a non-binding movement when they're slid through the table saw's miter slots.

To attach, use wood glue. To ensure their proper location, set the runners in the slots. Put a shim under them to make sure their top surface is a tad above the table surface. Now put a bead of glue down the center of the runners and place the plywood over them. Add a reasonable amount of weight over the place being glued and allow the adhesive to cure.

Next cut through about $\frac{1}{3}$ the sled. From the saw kerf, carefully draw a line that's perpendicular to the cut. Now make an equilateral triangle with the 90 degree point in the center of the saw kerf. The legs you draw extending to the perpendicular line will be the line you use when attaching your right and left miter fences.

I like to use angle iron for fences. It's strong, straight and provides a permanent attachment for disposable wooden facings. Make the two pieces of angle iron about two feet long, clip one leg of each end so that its angle is greater than 45 degrees. Now drill two holes along the length of the clipped leg and three holes along the adjoining leg. Make the holes just the right size for the screws you'll use for attaching the angle to the sled and the wood facings to the angle.

Set one angle in position on the sled matching the upright leg to the pencil line you drew. Clamp one end in place and use the hole in the iron to drill through the sled base. Countersink for the machine screw on the bottom side of the sled, slip the bolt in and secure it. Repeat the process for the other hole and the other angle iron.

Finally prepare the wooden facings. Make sure you cut a $\frac{1}{8}$ " square rabbet in the bottom edge, a space for sawdust to collect so your work can contact the fence properly. Make a test cut when done. Should you need to fine tune the angle, simply shim out the wooden facing by placing the shim between it and the angle. PW



3 PUT YOUR JIG TO USE • The beveled or faceted profile on the top of the leg is easily made using a new mitering jig (see story at left). I drew a line $\frac{5}{16}$ " in from each side and simply cut to the line.

that you'll later bevel on four sides (see photo). Believe it or not, it only takes about 10 minutes to do each leg and another 10 minutes to make the tool. In Chippendale fashion, make the bead on three edges of the leg. The inside corner is not beaded.

STEP 3&4 Attach the Legs and Add the Bottom • To attach the long sides of the box to the legs, I used two biscuits. If you are a follower of this Little Shop series, you already know that I make these using a router and slot cutting bit. Make the joint so the side is flush to the inside corner of the leg.

Originally I planned to join the end of the box the same way. But oops, the half-inch thick sides would mean the biscuit slots would be slicing through one another. That wouldn't do at all.

My "Plan B" was to glue corner blocks at each end of both short sides. The corner blocks are only $4\frac{1}{2}$ " long. This is because you want to put the bottom in later and it seemed easier to make the blocks short than try to notch the bottom to go around the blocks. This allowed me to screw through the side near the leg, thereby securing the end to the adjoining long side. Of course, you need to glue up the long sides to the legs first as well as the corner blocks to the ends. Even though you screw from the outside, the screw heads are hidden by the pickets that are applied later. I used polyurethane glue for the project because it was bound for outdoor service in the summer.

Slip the bottom in place from the bottom of the box. Remember that the bottom sits up a bit to look right as the height of a 6" pot is only about 5". I used a screw at each corner of the bottom to attach it to the corner blocks. I also cut a glue blocks to support the bottom along the long edges.

4 ASSEMBLY •

Assembly is in two stages. First biscuit the long sides to the legs so that the inside corner of the leg is flush with the inside edge of the side. Glue up the long sides to the legs. Now glue the corner blocks to the short ends. After the glue cures, apply glue to the blocks where the leg assembly joins, then screw together as shown here.



5 QUICK PICKETS • The mitering jig makes quick work of cutting the points on the picket tops. With a stop set to cut to the center of the top edge, I cut two pieces at once, then turned them and cut the second angle.

STEP 5 Finishing Touches • Next I sanded the project and painted the box sides green. This is certainly best done before attaching the pickets. While this was drying, I mitered all the pickets, then painted the pickets and legs white. When all the paint was dry I attached the pickets by

nailing two small brads in each one. A 1/4" spacer block provided the correct spacing between pickets. After these were applied, I gave the pickets a second coat of white paint. **PW**

—Steve Shanesy, PW staff

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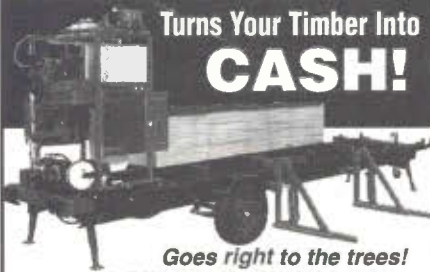
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TREES TO FURNITURE

Trees to Furniture

Lesson #1: It's harder than it looks

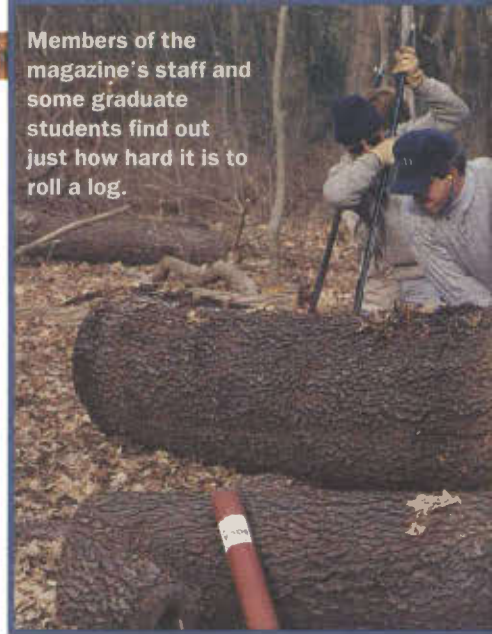
Editor's Note: Response from readers to our Trees to Furniture program, which helps turn waste logs into furniture-grade lumber for projects, continues to be heavy. A lot of you are at the point where you're wondering: How do I get started? To help answer the question, we had Michael Romanos and Sam Sherrill, the founders of the Cincinnati program, tell us how they got started. Here is their story.

It started with a single tree

This whole adventure started quite by accident late one fall day in 1995 after a bad storm. There had been heavy rains and wind for several days in a row in Cincinnati, but then the weather turned suddenly beautiful. Some of us went for a walk into the nearby nature preserve and we saw damage from the storm everywhere. Right in the middle of the path we were following was a great tree on the ground of a species I didn't recognize. The wood made visible by its toppling was beautiful, with a deep red heartwood core. I called Sam about it, and he came over to check it out the next day. We put together our combined wisdom and concluded that the log must be an American Cherry.

The next day we contacted the preserve's ranger and asked permission to remove the log and put it to good wood-

Members of the magazine's staff and some graduate students find out just how hard it is to roll a log.



working use. Permission was granted — the log was blocking the hiking path — as long as we promised not to disturb the forest ecosystem around the log. Given the amount of poison ivy in the area, we certainly intended to stay as close to the path as possible. But how in the world were we going to get this thing out of the forest?

That weekend, we assembled a small army of graduate students at my house and gave them marching orders. Armed with a couple chain saws, ropes, gloves and the promise of free pizza, the graduate students, Sam and I all descended on the forest. The plan was to cut the log into three pieces of manageable size, carry them up the incline one-by-one to where the pickup truck was parked, then unload them in my front yard. Finally, we'd gorge ourselves on pizza and pop.

We were a little too optimistic.

Water-saturated tree trunks are very heavy. This one was a good 18 inches across. And a 6-foot-long section weighed about a quarter of a ton. It took us five hours to

What is 'Trees to Furniture'?

Trees to Furniture is an effort started by two professors/woodworkers in Cincinnati who wanted to turn fallen urban trees into lumber for projects in their home shops. In the last two years, they've figured out the best ways to find the trees and have them cut into usable lumber by other people who own portable sawmills. And they do this for less than 50 cents a board foot.

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Or you can contact the founders directly:

• Sam Sherrill • samuel.sherrill@uc.edu

• Michael Romanos • michael.romanos@uc.edu

On the web: www.woodmizer.com • oz.uc.edu/trees



cut the log into three pieces that were between four and six feet long, to then rotate them into a good position for lifting, to lift them using ropes and belts and to then carry them up the 200 yards of rough terrain to the truck. Part of the difficulty was the terrain, but another part was our inexperience with lifting logs. It is a dangerous and back-breaking undertaking. Most of us slipped in the mud and had our fingers and toes pinched. But as we loaded the last log into the truck the painful expressions were replaced by triumphant looks.

We unloaded and stored the logs in my back yard until we could take them to the sawmill for cutting. We spent a great deal of time discussing how we could do this better, faster and safer. A few of the graduate students dropped out of school (we hope logging wasn't the cause) and others had heavy class loads and couldn't help. So it was no small task.

We have harvested lots of logs since that first time and have figured out how to do it without abusing our friend's good will and without hurting ourselves. We've also concocted several devices to help us move wood, with varying degrees of success. But the movement of logs remains a dangerous undertaking — one that needs care, respect for the tree and a realistic understanding of the tree's significance and shortcomings.

So what happened to that first tree? Some of it is now in my living room in the form of a low, comfortable armchair. The rest is being made into a display cabinet. The tree is down, but not gone. **PW**

—Michael Romanos and Sam Sherrill



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WOOD TYPES

Cypress

(*Taxodium distichium*)

Other Common Names: Baldcypress, Pond cypress, Red cypress, Southern cypress, Yellow cypress, Louisiana red cypress, Cow cypress

Growing Regions: Cypress is found in the South and as far north as Illinois and Pennsylvania. The tree thrives in swamps, riverbanks and flood plains and many times is partially submerged.

Characteristics of Tree: This large aquatic tree can grow as high as 120 feet with a trunk diameter of as much as 5 feet.

Characteristics of Wood: Cypress, which commonly looks like Yellow pine, is extremely resistant to decay and stronger than most softwoods. The grain is normally straight. Cypress has a coarse texture, and oil from the wood gives the wood a greasy feel. Freshly milled cypress can smell a bit sour, though the wood is safe for use on kitchen utensils. When cypress is attacked by fungus, it will form pockets of color in the wood. This is

Finished

Unfinished

called "Pecky cypress" and is desirable to some woodworkers. Pecky cypress occurs in trees older than 200 years. Cypress shrinks little as it dries.

Finishing Characteristics: Cypress takes paint very well. It finishes fine and actually blotches less than pine.

Workability: Nails and glues well. Cypress is brittle so drill pilot holes when using fasteners near the ends of boards.

Common Uses: Furniture, food containers, kitchen cabinets, pallets, rustic furniture, flooring, shipbuilding, interior trim.

Availability: Common

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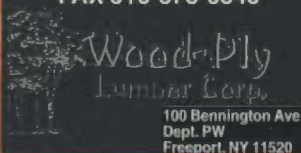
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Contact: Makita USA
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Contact: Ryobi 800-525-2579
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For more information, circle #151 on the Resource Directory Coupon.



PRODUCT UPDATE

In the January 1998 issue we reported Makita had unveiled Nickel Metal Hydride (NiMH) as the next generation in battery technology for cordless tools, though the tool it would be used with was unknown at that time. Now in stores are two new NiMH cordless drills from Makita. The 12-volt 6213DWBE (\$229) and the 14.4-volt 6233DWBE (\$249) come with two batteries and a flashlight.

Also in the January 1998 issue we unveiled Jacobs new wrenchless Router Chuck™. At that time it had not

"Delta offers a handy, affordable and versatile new product with its shaper jig and improves on existing designs with its Sidekick."—PW

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Contact: Delta International, 800-438-2486

(www.deltawoodworking.com/delta)

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- Now with a 15-amp motor, horizontal handle, increased deck width and improved gearing
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43-188
Sliding
Shaper Jig



36-240
Sidekick

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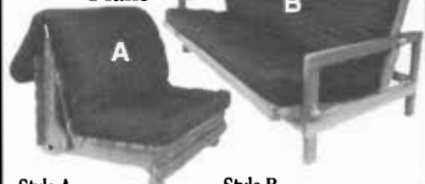


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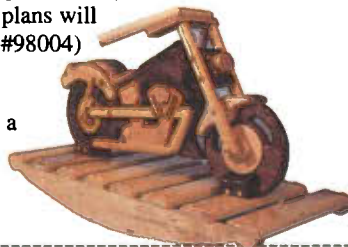


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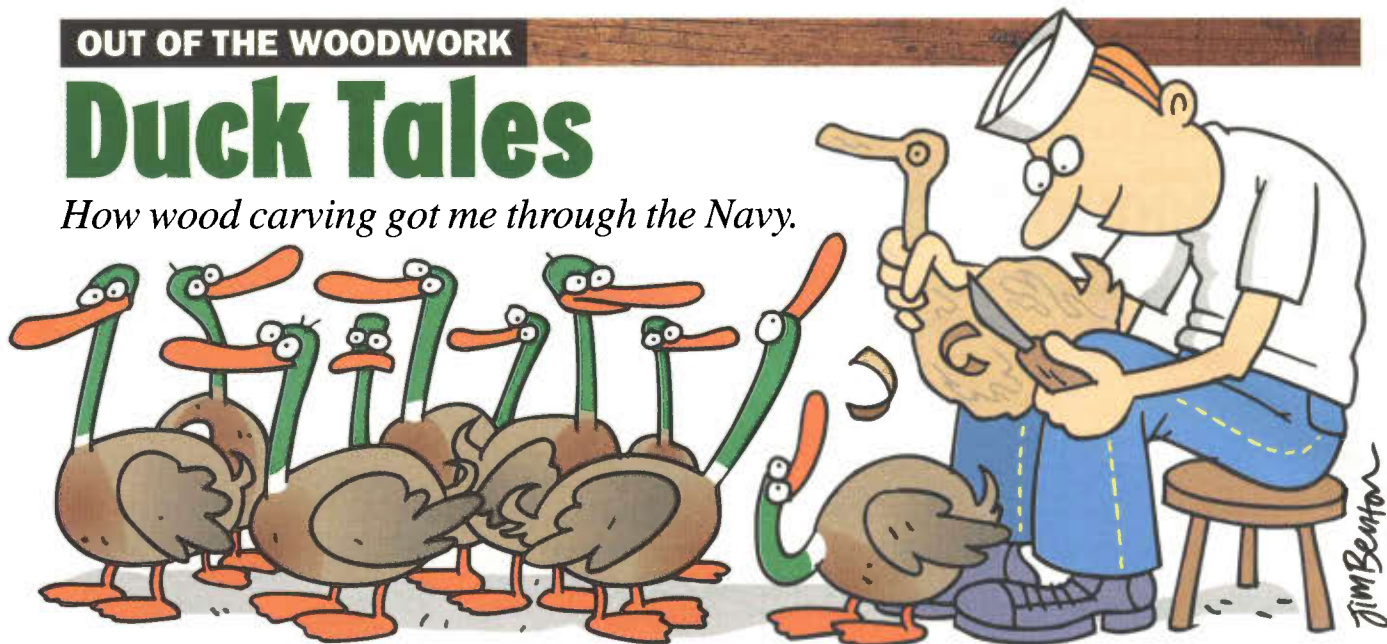
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Duck Tales

How wood carving got me through the Navy.



IN 1969 I enlisted in the Navy. And after a year of training in Florida, I found myself fighting boredom on the beaches of Scotland at a communications station up beyond Edinburgh. It was about as isolated a duty station as one could get. There was a 10-mile stretch of farm ground between the Grampian Mountains and the cold North Sea, and it was a hard 30 miles north or south to a town of any size. One day I heard the familiar sound of a table saw. I had been building stuff since I could pick up a hammer and soon ingratiated myself into the base's repair shop. I built a desk and shelves for my barracks room using the shop after hours. It felt good to be working wood again.

I still had a lot of time on my hands, but I couldn't figure out what to build next — my room was already overstuffed. I started thinking about small stuff. I'd always admired the bird carvings I'd seen, so I decided to carve some decoys.

The sole book on wood carving in the base's library was insistent that you carve from real life, and this was a dilemma. Although Scotland was a naturalists' paradise I didn't know jack about birds. How was I going to get a duck to sit still and model for me?

Now this was before the lottery system determined your likelihood of serving in the military, so the underclass of the military was filled with the odd flotsam of perfectly patriotic Americans who were dubious about Vietnam. In the Navy, only those with degrees in math, physics

or some other hard science were eligible for officer school, so the enlisted ranks of the Navy were swollen with English and theater majors; and occasionally, an obscure specialty cropped up, too. Like John Trapp, who showed up as my roommate with a master's degree in ornithology. "My duck dilemma is over," I thought.

John was, without a doubt, the most unusual person I'd ever met. At that time beards were allowed in the Navy, and John had the most exuberant beard I'd ever seen — one that would have given those guys from the rock group Alabama a run for their money. Now if most of us swabbies were a bit bored with the bucolic life, John was in paradise. Although he performed his military duties with perfunctory ease, he did his serious work after hours, and that work was birds. He researched habitat, reproduction, migratory patterns and published in magazines such as *Jackpine Warbler*, *Birder's World* and other odd-ball publications. But it was during a spate of Shellduck deaths that I really began to value John's specialty.

I was still kicking around carving decoys when John brought a bag of dead ducks from one of his sojourns to the seaside. "I'm going to do autopsies after the eve watch tonight," he said. Well that was fine with me because suddenly I had the models I'd been needing to carve from. We had a little refrigerator in our room, and John stuffed the ducks in among the cans of Coke and bologna. (John was pretty cavalier about sanitary stuff.)

We were ready to begin an eve watch

at 4 p.m. when our door burst open and the call, "Attention on deck" rang out.

One of the unpleasanties of military life were unexpected inspections. We were to keep the rooms spotless, and we ourselves were always supposed to be ready for inspection, too. Of course, we stood rigidly at attention while these two spit-and-polish sorts counted our dust bunnies and frowned at John's beard.

Even though it was just 3:30, we were so far north that the sun was setting, and the room was bathed in a warm golden light. The two Napoleons were almost done when one pointed to the refrigerator. They both bent over to open the small door. And when Tweedledum opened it, masses of dead ducks poured out onto the floor and onto Tweedledee's brightly shined shoe. Not a word was said by either one, but their eyes locked. To this day, I don't know what passed between them, but they left in a hurry with the ducks still lying on the deck.

Our inspection passed into the base's collection of folklore. Later I heard new guys tell grossly exaggerated renditions of the tale. And despite almost continuous unannounced inspections all around us, John and I were never inspected again. And that's how an interest in wood carving got me through the Navy. **PW**

Andrew Schultz is a woodworking author in Lincoln, Nebraska. His book, "Building Mission-Style Furniture" (Popular Woodworking Books), will be published in spring 1999.

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